DOE/RL-96-73
Revision 3

324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Area Closure Plan

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

DOE/RL-96-73
Revision 3

324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Area Closure Plan

Date Published
August 2005

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

J. D. Aardal 9/2/2005
Release Approval Date

DOE/RL-96-73, Revision 3
324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

for Owner/Operator
Keith A. Klein, Manager
U. S. Department of Energy
Richland Operations Office

10/28/05
Date

324 BUILDING RADIOCHEMICAL ENGINEERING CELLS, HIGH-LEVEL VAULT, LOW-LEVEL VAULT, AND ASSOCIATED AREAS CLOSURE PLAN

FOREWORD

The Hanford Site is owned by the U.S. government and operated by the U.S. Department of Energy, Richland Operations Office. Dangerous and mixed waste (containing both radioactive and dangerous components) are produced and managed on the Hanford Site. The dangerous waste is regulated in accordance with the *Resource Conservation and Recovery Act of 1976* and the *State of Washington Hazardous Waste Management Act of 1976* (as administered through the Washington State Department of Ecology *Dangerous Waste Regulations*, Washington Administrative Code 173-303). The radioactive component of mixed waste is interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act of 1954*; the nonradioactive dangerous component of mixed waste is interpreted to be regulated under the *Resource Conservation and Recovery Act of 1976* and Washington Administrative Code 173-303.

For purposes of the *Resource Conservation and Recovery Act of 1976* and the Washington State Department of Ecology *Dangerous Waste Regulations*, the Hanford Site is considered to be a single facility. The single dangerous waste permit identification number issued to the Hanford Site by the U.S. Environmental Protection Agency and the Washington State Department of Ecology is U.S. Environmental Protection Agency/State Identification Number WA7890008967.

The areas within the 324 Building, covered by this closure plan, are not covered by a *Resource Conservation and Recovery Act of 1976* Part A, Form 3, Dangerous Waste Permit Application. However, the areas are being closed pursuant to the requirements for *Resource Conservation and Recovery Act of 1976* closure for interim status treatment, storage, and disposal (TSD) units as documented in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1996) as milestones (Milestones M-89-00 and M-20-55). Information provided in this closure plan is current as of March 2005.

Previous submittals of this closure plan include the initial submittal "324 Building REC and HLV Closure Plan," submitted in 1995 (PNL-10890), "The 324 Building Radiochemical Engineering Cells and High-Level Vault Closure Plan," revision 0 of this document, submitted in 1997, and the *324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan* (DOE/RL-96-73, Revision 1) submitted in March 1998. On May 11, 2005, the U.S. Department of Energy, Richland Operations Office drafted and submitted revision 2 of the closure plan to the Washington State Department of Ecology. However, revision 2 was not approved. Instead of further revising revision 2, the U.S. Department of Energy, Richland Operations Office and the Washington State Department of Ecology conducted workshops to resolve the outstanding issues with the closure plan application. The closure plan application was revised to reflect the language agreed to during the workshops held on July 28, August 3, and August 4, 2005. This revised application is titled, *324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan* (DOE/RL-96-73, Revision 3).

This page intentionally left blank.

DOCUMENT CONTENTS

APPENDICES

This page intentionally left blank.

ACRONYMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
ATS	alternative treatment standards
BCCP	B-Cell Cleanout Project
BNWL	Battelle-Northwest Laboratories
BWHC	B&W Hanford Company
BWR	boiling water reactor
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CCTV	closed-circuit television
CFR	Code of Federal Regulations
COC	constituent of concern
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EDL	Engineering Development Laboratory
EM-40	DOE Office of Environmental Restoration
EM-60	DOE Office of Nuclear Material and Facility Stabilization
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQL	estimated quantitation limit
FDH	Fluor Daniel Hanford, Inc.
FR	Federal Register
FRG	Federal Republic of Germany
HEPA	high-efficiency particulate air
HLLW	high-level liquid waste
HLV	high-level vault
HLV/LLV	high-level vault/low-level vault
HLW	high-level waste
HNF	Hanford Nuclear Facility (document identifier)
HQ	headquarters (DOE)
HVAC	heating, ventilation, and air conditioning
IC	ion chromatography
ICP	inductively coupled plasma
ICP/AES	inductively coupled plasma/atomic emission spectroscopy
ICP/MS	inductively coupled plasma/mass spectroscopy
LDR	land disposal restrictions
LLV	low-level vault
LLW	low-level waste

MSDS	material safety data sheet
MW	mixed waste
ND	not detected
NDE	nondestructive examination
NWVP	Nuclear Waste Vitrification Project
PHMC	Project Hanford Management Contract
PMP	project management plan
PNL	Pacific Northwest Laboratory
PNNL	Pacific Northwest National Laboratory
PUREX	plutonium-uranium extraction
PWR	pressured water reactor
R&D	research and development
RCRA	*Resource Conservation and Recovery Act of 1976*
REC	radiochemical engineering cells
RLFCM	radioactive liquid-fed ceramic melter
RPD	relative percent difference
S&M	surveillance and maintenance
SCW	special case waste
SMF	Shielded Materials Facility
SNF	spent nuclear fuel
TC	toxicity characteristic
TCLP	toxicity characteristics leaching procedure
TPD	Transition Projects Division
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order
TRU	transuranic (waste)
TSD	treatment, storage, and/or disposal
WAC	Washington Administrative Code
WDOH	Washington Department of Health
WSEP	Waste Solidification Engineering Prototype
WTEL	Waste Technology Engineering Laboratory
ZVDP	Zeolite Vitification Demonstration Project

TERMS

Bq/g	becquerels per gram
Bq/L	becquerels per liter
Ci	Curie
°C	degree Celsius
d/m-ml	disintegrations per minute per milliliter
g/ml	grams per milliliter
m^3	cubic meters
R/hr	roentgen per hour
µg/g	microgram per gram
µg/L	microgram per liter
µg/ml	microgram per milliliter

METRIC CONVERSION CHART

Into metric units / Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1993, Professional Publications, Inc., Belmont, California.

CONTENTS

APPENDICES

FIGURES

This page intentionally left blank.

1.0 INTRODUCTION AND OVERVIEW

The Hanford Site, located adjacent to and north of Richland, Washington, is operated by the U.S. Department of Energy, Richland Operations Office (RL) (Figure 1-1). The 324 Building is located in the 300 Area of the Hanford Site (Figure 1-2). The 324 Building was constructed in the 1960s to support materials and chemical process research and development activities ranging from laboratory/bench-scale studies to full engineering-scale pilot plant demonstrations. In the mid-1990s, it was determined that dangerous waste and waste residues were being stored for greater than 90 days in the 324 Building Radiochemical Engineering Cells (REC) and the High-Level Vault/Low-Level Vault (HLV/LLV) tanks.

Through the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) Milestone M-89 (Ecology, et al., 1996), agreement was reached to close the nonpermitted RCRA unit in the 324 Building. This closure plan, managed under TPA Milestone M-20-55, addresses the identified building areas targeted by the Tri-Party Agreement and provides commitments to achieve the highest degree of compliance practicable, given the special technical difficulties of managing mixed waste that contains high-activity radioactive materials and the physical limitations of working remotely in the areas within the subject closure unit. Tri-Party Agreement Milestone M-094-03 was established in April 2002 and requires complete disposition of the 324 Building, as addressed in Chapter 1.0, Section 1.3.2 of this closure plan.

This closure plan is divided into nine chapters. Chapter 1.0 provides the introduction, historical perspective, 324 Building history and current mission, and the regulatory basis and strategy for managing the closure unit, with Section1.3.2 addressing compliance agreements. Chapters 2.0, 3.0, 4.0, and 5.0 discuss the detailed facility description, process information, waste characteristics, and groundwater monitoring, respectively. Chapter 6.0 deals with the closure strategy and performance standard, including the closure activities for the B-Cell, D-Cell, HLV, LLV, piping and miscellaneous associated building areas. Chapter 7.0 addresses the closure activities identified in Chapter 6.0, and also adds information on closure activities for the soil directly beneath the unit, regulated material removed during closure, and the schedule for closure. Chapter 8.0 provides surveillance, monitoring and postclosure information and Chapter 9.0 provides a list of references used throughout the document.

1.1 HANFORD SITE AND 300 AREA OVERVIEW

The Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State. The Hanford Site occupies an area of approximately 1,450 square kilometers located adjacent to and north of Richland, Washington. The Hanford Site has restricted public access and provides a buffer for the smaller areas (including reactors, chemical separation facilities, and special nuclear material facilities) onsite that historically were used for production of nuclear materials and waste storage and disposal. About 6 percent of the land area has been disturbed and is actively used. One of the major operational areas includes the 300 Area, which is located just north of Richland. The 300 Area covers 4.3 square kilometers. The 324 Building lies within the boundary of the 300 Area.

The Hanford Site is owned by the U.S. government and operated by the U.S. Department of Energy, Richland Operations Office (RL) in conjunction with its contractors. The Hanford Site missions are to safely clean up and manage the site's legacy wastes, and to develop and deploy science and technology, as noted in DOE/RL-96-92, *Hanford Strategic Plan*. Dangerous waste and mixed waste (containing both dangerous and radioactive components) are produced and managed on the Hanford Site. Waste components are regulated in accordance with the *Resource Conservation and Recovery Act of 1976* (RCRA), *The Hazardous and Solid Waste Amendments of 1984*, and or the *State of Washington*

Hazardous Waste Management Act of 1976 (as administered through the Washington State Department of Ecology (Ecology) *Dangerous Waste Regulations*, Washington Administrative Code (WAC) 173-303; or the *Atomic Energy Act of 1954)*. Throughout this closure plan, 'mixed waste' refers to waste containing both dangerous and radioactive components. Radioactive waste and the radioactive component of mixed waste are interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act of 1954*; dangerous waste and the nonradioactive dangerous waste component of mixed waste are interpreted to be regulated under the RCRA and WAC 173-303.

For the purposes of RCRA, the Hanford Site is considered a single facility encompassing a number of waste management units. The U.S. Environmental Protection Agency (EPA) and Ecology have issued a single dangerous waste permit identification number (EPA/State Identification Number WA890008967) to the Hanford Site. All waste management activities carried out under the assigned identification number are considered to be 'onsite' as defined in WAC 173-303.

1.2 324 BUILDING

A history and description of the building are provided in the following sections.

1.2.1 324 Building Description

The 324 Building is a substantial concrete and steel structure. The 324 Building is divided into four integrated-but-separate primary work areas: the Engineering Development Laboratory-102 (nonradioactive) or EDL-102, the Engineering Development Laboratory-146 (radioactive) or EDL-146, the radiochemical engineering cells (REC), and the Shielded Materials Facility (SMF). Additional facilities in the 324 Building include development laboratories, maintenance shops, and service areas. Within the 324 Building are controlled experimentation areas referred to as 'hot-cells' with radiation shielding provided by thick concrete walls. To protect against releases of radioactive material from the hot cells to the environment, integral metal liners with sumps (i.e., without drains) were installed in the cells and tank vaults. Confinement of radioactive particulate matter within the shielded cells is provided by a directed air flow through high-efficiency particulate air (HEPA) filter ventilation system (Chapter 2.0 provides a detailed facility description).

1.2.2 324 Building History

The 324 Building (and associated support facilities), known as the Waste Technology Engineering Laboratory (WTEL), was constructed from 1964 to 1966 in the 300 Area (Figure 1-2). Based on photographs and a report on unconfined underground radioactive waste in the 300 Area (Paas 1955) the 324 Building was constructed over a site that was used for burying dry low-level waste beginning in 1943 (Figure 1-3). Total activity of buried material was not reported. Before construction of new facilities in this area in late 1951, the buried material was moved to a location approximately 200 meters to the north of the previous burial ground.

The 324 Building was designed and constructed to allow for a high degree of versatility in completing complex and varied experimentation on highly radioactive wastes to develop approaches for waste treatment and storage activities. The 324 Building was designed as a single integrated facility for orderly progression of nonradioactive and/or radioactive development studies from laboratory or bench-scale to full engineering-scale pilot plant demonstrations. The facility houses radiochemical and radiometallurgical hot cells and laboratories. The facility supported several RL related initiatives for highly radioactive chemical processing and metallurgical engineering studies. As a result of residues and internal facility spills during the conduct of these activities, the facility contains areas with significant fixed and dispersible mixed waste contamination.

In November 1996, the 324 Building was transferred from the Pacific Northwest National Laboratory (PNNL) to Fluor Hanford (FH), to begin the transition from its historic programmatic mission of waste technology research to a deactivation and stabilization mission. Nonradioactive and radioactive waste treatability studies ongoing at the time of transition were completed within the initial phase of deactivation. These activities were conducted by PNNL under a tenant-landlord agreement with BWHC in the cold side (nonradioactive) laboratories, in the 324 Building C-Cell and in EDL-146.

1.3 CLOSURE REQUIREMENT HISTORY

Closure requirement history is described in two parts: closure regulatory basis and compliance agreements.

1.3.1 Closure Regulatory Basis

In April 1993, Ecology and the EPA were notified that RL had determined that the REC B-Cell and the high-level vault (HLV) within the 324 Building were being used to manage or store mixed waste (DOE-RL, 1997). This unit was not permitted under RCRA; therefore, these activities were not in compliance with RCRA regulations.

In January 1995, Ecology conducted a Dangerous Waste Compliance Inspection of the 324 Building (Ecology, 1995a). The inspection included the nonpermitted 'storage facility' containing mixed waste. The inspection was required to support resolution of a dispute resulting from TPA negotiations. The goals of the inspection included: (1) documenting the current regulatory compliance status of 324 Building using a checklist inspection technique, (2) documenting the permit status by assessing all potentially applicable Hanford Site permit applications, (3) establishing when RL/PNNL first became aware of their compliance deficiency and documented actions taken to notify Ecology or the EPA and to correct or mitigate the deficiencies, and (4) allowing EPA an opportunity to obtain information to support the dispute resolution and to gather information to support potential joint compliance actions that may require EPA's regulatory authority over the Land Disposal Restriction (LDR) regulations (40 CFR 268).

Negotiations for resolution of the noncompliant RCRA issues were conducted among Ecology, EPA, and RL using the Tri-Party Agreement dispute resolution process. On February 7, 1995, the Tri-Party Agreement Dispute Resolution Committee agreed to the following: (1) Ecology would issue a Voluntary Compliance letter (Ecology, 1995b), to document the areas of noncompliance associated with the 324 Building REC and HLV and (2) RL, Ecology, and PNNL would negotiate Tri-Party Agreement milestones to close the noncompliant TSD Unit. It was agreed that the Tri-Party Agreement milestones would be sufficient to satisfy regulatory enforcement for the areas of noncompliance.

The 1995 Voluntary Compliance letter (Ecology, 1995b) noted the following violations:

- Failure to ship waste offsite within 90 days of accumulating 208 liters or more
- Failure to store mixed waste in containers or tanks per WAC 173-303-200(1)(b)
- Failure to meet tank requirements per WAC 173-303-640(2) and (6)

- Failure to apply for interim status and failure to meet interim status facility standards per WAC 173-303-400

- Failure to prepare LDR notifications for shipments of mixed waste offsite per WAC 173-303-140(2)(a) and 40CFR268.7(a)(1).

- With Ecology's approval, RL and PNNL initiated efforts to operate the 324 Building REC and HLV in compliance with interim status RCRA standards and to clean out the REC.

1.3.2 Compliance Agreements

Because of radiation, storage, and shipment concerns, it would not be possible to immediately remove the mixed waste material from the units. Radiation levels within these units are estimated to range between 1 R/hr to > 10^6 R/hr. Ecology and RL agreed that PNNL would continue managing the waste in the REC and HLV in a manner appropriate for the radiological risks posed by the waste.

Based on the nonpermitted activities and the special radiological considerations, the following Tri-Party Agreement Milestones signed July 28, 1995 (Appendix 1A) were established to address these issues and complete closure of the nonpermitted mixed waste units in the 324 Building REC and HLV:

- Milestone M-89-01 identified the HLV tanks that contained liquid mixed waste as tanks 104, 105, 107, and directed RL to remove the mixed waste, flush, and drain these tanks. This milestone was completed in October 1996.

- Milestone M-89-02, completed in March 2001, required removal of B-Cell mixed waste and excess equipment. Actions required under this milestone were incorporated into Chapter 7.0.

- Milestone M-89-03 required compliance with interim status facility standards for the nonpermitted 324 Building areas. Because of the high radiation fields associated with mixed waste stored in the REC and HLV, alternative compliance measures for some interim status requirements were employed. This milestone was completed in March 1995.

- Milestone M-89-04 required RL to identify mixed waste management alternatives. This milestone was completed in June 1995.

- Milestone M-20-55 required the submittal of a closure plan for the previously identified unpermitted TSD unit in the 324 Building. This milestone was satisfied with the initial submittal of this closure plan to Ecology in December 1995. The closure plan subsequently was modified and resubmitted in May 1997. Revision 1 of the closure plan was submitted in March 1998 to resolve comments and issues with the initial and subsequent closure plan, to reflect the change in building mission and management, and to provide better integration of closure activities with building stabilization and decontamination activities and with the *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980* remedial actions for the 300 Area operable units. Ecology approved Revision 1 of the closure plan in September 1998.

Meetings were held during 1996, among all the parties involved, that resulted in the *January 1997, Summary of Agreements Reached During the Data Quality Objectives Process: 324 Building* (Ecology and DOE-RL 1997). This agreement defined the boundaries of the nonpermitted RCRA closure unit, those components requiring action and no action (refer to Figure 1.4, and Chapter 2.0, Section 2.1) and sampling and analysis information of rinsates from the HLV after completion of inventory removal.

Tri-Party Agreement Change Number M-89-98-03 was approved in November 1998 and changed the due date for Milestone M-89-02 from May 31, 1999 to November 30, 2000.

Tri-Party Agreement Change Number M-89-99-01 was approved in August 1999 and established the due date for Milestone M-89-00 as October 31, 2005. The scope of Milestone M-89-00 is to complete closure of non-permitted mixed waste units in the 324 Building as described in this closure plan.

Tri-Party Agreement Change Number M-094-01-01 was approved in April 2002 and established the M-094 Series Milestones and provided the overall framework for disposition of 300 Area facilities. Milestones M-094-02 and M-094-03 were established by Change Number M-094-01-01 and are described below.

Tri-Party Agreement Milestone M-094-02 was defined in Change Number M-094-01-01 as: "Submit an amendment to the existing 324 Building REC/HLV Closure Plan, DOE/RL-96-73, Rev. 1, for Ecology review and approval. The amendment shall change the existing closure path from clean closure to a path where the high-risk materials and wastes are removed from the facility followed by complete disposition." The amendment to the closure plan was submitted to Ecology in July 2002 and was approved by Ecology in December 2002 (Ecology, 2002). This Revision 2 to the closure plan incorporates the amendment change in closure path and closure standard to "removal" instead of clean closure. The closure performance standard is changed to complete removal of each component requiring closure. Table 6-1 in Chapter 6 reflects the removal actions for each applicable area of the 324 Building. Modification of the performance standard of individual components is changed from clean closure in accordance with the Debris Rule "clean debris surface" to "removal". Removal and disposal of these components will be coordinated with overall disposition of the facility under CERCLA. Any dangerous waste materials will be managed in accordance with WAC 173-303-610(5). All other wastes will be managed in accordance with applicable removal action documents.

Milestone M-094-03 requires the complete disposition of the 324 Building by September 30, 2010. Completion of facility disposition is defined in Change Number M-094-01-01 as the completion of deactivation, decontamination, and decommissioning, and obtaining EPA and/or Ecology approval of the appropriate project closeout records. Complete facility disposition will be performed in parallel with the removal and closure of the mixed waste units in the 324 Building. Closure of the Milestone M-89-00 mixed waste units in the 324 Building as described in the closure plan will be performed in parallel with the complete disposition of the 324 Building under M-094-03. Closure activities will be conducted and certified in accordance with the approved closure plan.

1.4 324 BUILDING DEACTIVATION

While specified areas (Chapter 2.0, Section 2.2) of the 324 Building are undergoing closure, the entire building will be undergoing deactivation and complete disposition. The closure performance standard of complete removal for the mixed waste units will be accomplished in parallel with removing the 324 Building. The endpoint(s) for deactivation, decommissioning, and demolition of the 324 Building will be complete removal of the 324 Building. The purpose of the 324 Building deactivation activities is to accomplish safe and cost-effective deactivation using innovative techniques that mitigate facility risk to low-cost, stable conditions requiring minimal surveillance and maintenance. Facility deactivation activities will be performed to prepare the facility for demolition. Deactivation activities will include removal of equipment and material as addressed by the closure plan and facility disposition planning. Facility disposition baseline planning will be performed in support of the Tri-Party Agreement M-094 series milestones, as appropriate, based on applicable Hanford contract and work scope. Completion of facility disposition is defined by TPA Change Number M-094-01-01 as the completion of deactivation, decontamination, and decommissioning (including demolition), and including obtaining EPA and/or Ecology approval of the appropriate project closeout documents. Facility disposition activities therefore will include deactivation, decontamination, decommissioning, demolition, and closure activities, including obtaining regulatory approvals of closeout documentation. Closure of the 324 mixed waste units will be documented and approved as required by the closure plan. Facility Surveillance and Maintenance (S&M) activities will be performed as necessary to maintain compliance with regulatory requirements, closure plan requirements, and facility safety basis requirements. Facility S&M activities will be performed as applicable during the various phases of deactivation and disposition, and during applicable transition periods during the overall disposition and closure process.

Facility deactivation removes, reduces, and/or stabilizes dangerous waste and mixed waste within the 324 Building. Completing these activities reduces potential hazards to personnel, the public, and the environment and allows for a reduced level of surveillance.

In November 1996, planning began for deactivating the 324 Building. The objective of the deactivation planning was to identify the activities needed to establish a passively safe, environmentally secure configuration and ensure that the configuration could be retained after deactivation. This effort culminated in the *324/327 Project Management Plan for the 324/327 Facilities Stabilization Project* (HNF-IP-1289). This project management plan (PMP) presents the deactivation approach to be used for the two facilities and the supporting cost, schedule, and scope baselines. The PMP was prepared based on lessons learned from previous deactivation project PMP and with guidance provided in DOE Order 4700.1, *Project Management System*, and the Tri-Party Agreement, Section 8.0, "Facility Decommissioning Process."

Key technical objectives for the 324 Building Deactivation activities are as follows:

- Closure activities will be completed to meet Tri-Party Agreement commitments (Chapter 2.0, Section 2.2).

- Facility configuration will be established such that active systems are not required for safety and environmental confinement.

- Deactivation activities will be performed in a way that will be consistent with the categorization of a radiological facility per the criteria and guidelines provided in DOE-STD-1027, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports."

1.5 CLOSURE PLAN AND DEACTIVATION INTEGRATION

This closure plan is for an unpermitted RCRA unit, and as such, will not be incorporated into the Hanford Site RCRA Permit (Ecology 1994). Management of closure will be based on agreements made between the RL and Ecology, as described in this closure plan and documented in the Administrative Record. The closure driver for the 324 Building mixed waste units is the Tri-Party Agreement Milestone M-20-55 and M-89. General requirements for RCRA closure are discussed in the Tri-Party Agreement. These requirements (Section 5.3 of the Tri-Party Agreement) state that 'all [treatment, storage and/or disposal] TSD units that undergo closure, irrespective of permit status, shall be closed pursuant to the authorized State Dangerous Waste Program in accordance with WAC 173-303-610. The driver for complete disposition of the 324 Building is Milestone M-094-03, which will be performed in parallel with closure of the M-89-00 mixed waste units.

Previous submittals of this closure plan include the initial submittal "324 Building REC and HLV Closure Plan," submitted in 1995 (PNL-10890), "The 324 Building Radiochemical engineering Cells and High-Level Vault Closure Plan," Revision 0, submitted in 1997, and the *324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan* (DOE/RL-96-73, Revision 1) submitted in March 1998.

The purpose of the March 1998 closure plan revision was to lay out a path forward for closure of the nonpermitted TSD identified areas within the 324 Building. These areas are discussed in Chapter 2.0, Section 2.1. As a part of the overall 324 Building deactivation and compliance agreement activities, there currently are ongoing and planned projects, including activities associated with: (1) waste removal under the M-89 Tri-Party Agreement Milestone, (2) completion of activities to meet closure requirements (3) removal of residual radioactive contamination, waste, and equipment, (4) deactivation project as defined in the project management plan (HNF-IP-1289), and (5) completion of activities to meet building endpoint criteria.

The strategy for 324 Building cleanout and ultimate closure of those areas covered by this closure plan (Chapter 2.0, Section 2.2) includes the coordination of the facility deactivation activities and the final closure of the areas and equipment (and associated piping/systems) within the closure boundary. The deactivation activities described below are provided for information only. This is depicted in Figure 1-4 and described by the following:

- Research and Development Activities – This item (shown in Figure 1-4) was the previous mission of the facility managed by PNNL.

- Building Deactivation – The 324 Building deactivation activities (shown in Figure 1-4) covers the deactivation and minimum safe activities within the 324 Building and adjacent buildings. In addition, subprojects are performing closure activities in response to existing Tri-Party Agreement Milestones (B-Cell cleanout and the HLV/LLV tank closures). Deactivation activities will remove and/or reduce human health and environmental hazards associated with the 324 Building.

- Deactivation activities have been managed through several subprojects (Figure 1-4) based on areas and facility systems. These projects include 324 Minimum Safe, B-Cell Cleanout Project, Cesium Removal Project, A-Cell Cleanout Project, Radiochemical Engineering Complex Deactivation, Shielded Material Facility Deactivation, 324 Laboratory and Experimental Area Deactivation, 324 Heating, Ventilation, and Air Conditioning (HVAC), 324 Waste Streams and Utilities, and various nonnuclear support areas. As addressed in section 1.4 of this closure plan, facility deactivation activities will be performed to prepare the facility for demolition. Deactivation activities will include removal of equipment and material as addressed by the closure plan and facility disposition planning. Facility disposition baseline planning will be performed in support of the Tri-Party Agreement M-094 series milestones, as appropriate, based on applicable Hanford contract and work scope. As required by M-094 requirements, facility disposition activities will include deactivation, decontamination, decommissioning, demolition, and closure activities, including obtaining regulatory approvals of closeout documentation. Closure of the 324 mixed waste units will be documented and approved as required by the closure plan. Facility Surveillance and Maintenance (S&M) activities will be performed as applicable during the various phases of facility deactivation and disposition necessary to maintain compliance with regulatory requirements, closure plan requirements, and facility safety basis requirements.

The following projects (as shown in Figure 1-4), when completed, will meet the mission requirements and objectives described in Section 1.4, including the physical and administrative closure of the REC/HLV/LLV and associated areas:

- Residual Contamination/Waste/Equipment Removal -- Efforts are under way to clean out both regulated and nonregulated waste from the 324/327 Buildings in support of the mission objectives and for waste classified as "Special Case Waste" under Tri-Party Agreement M-92.

- Waste Removal Under Milestone M-89 (M-89-00,01,02) -- Efforts are under way to clean out both regulated and nonregulated waste from the 324 Building in support of the mission objectives and the Tri-Party Agreement Milestones involving areas within the closure unit boundary (TPA-M-89-00,01,02; refer to Chapter 3.0, Section 3.3 and Chapter 7.0).

- Deactivation Endpoints -- As addressed in section 1.4 of this closure plan, facility deactivation activities will be performed to prepare the facility for demolition. Deactivation activities will include removal of equipment and material as addressed by the closure plan and facility disposition planning. As required by M-094 requirements, facility disposition activities will include deactivation, decontamination, decommissioning, demolition, and closure activities, including obtaining regulatory approvals of closeout documentation. Facility Surveillance and Maintenance (S&M) activities will be performed as applicable during the various phases of facility deactivation and disposition necessary to maintain compliance with regulatory requirements, closure plan requirements, and facility safety basis requirements.

- Closure Plan criteria -- The closure plan criteria and closeout requirements are established in Chapters 6.0, 7.0, and 8.0 of this closure plan. If closure plan activities are not completed in a manner that allows closeout/acceptance of closure criteria, additional activities will be conducted following reevaluation.

- Demonstrate no releases of dangerous waste to the environment -- The demonstration criteria is covered in Chapters 6.0 and 7.0. If this criteria is met, certification activities will be completed and the unit will be closed (Clean Closed). If clean closure cannot be demonstrated, surveillance and maintenance activities will be performed consistent with criteria established in Chapter 8.0.

1.6 ROLES AND RESPONSIBILITIES

From 1965 until 1996, PNNL managed operations of the 324 Building. In November 1996, oversight responsibility for the 324 Building was transferred from PNNL to FH, the integrating contractor under the Project Hanford Management Contract (PHMC). Since November 1996, the building has been operated by BWHC, a major subcontractor to FH, responsible for facility transition projects, and by FH.

The management organization for the 324 closure activities represents a partnership between three principle project organizations. The three project organizations and their associated summary responsibilities are described in the following paragraphs.

- DOE-HQ – HQ is primarily responsible for policy and budget decisions affecting the project. Summary responsibilities for the HQ project manager are as follows:

  - Act as the point of contact for matrixed HQ support organizations

  - Act as the final decision authority when project management team decisionmaking deadlocks occur

  - Review project scope, cost and schedule objectives

- Approve HQ milestones and project funding

- Act as the liaison for HQ organizations and establish proactive communication paths to enhance timely decisions

- Keep HQ management informed of project status and obtain direction as necessary.

- RL - The RL Assistant Manager for the River Corridor has field responsibility for the project. The assigned RL project manager is the project interface at RL for DOE-HQ, FDH, and RL matrixed organizations.

  The RL project manager's primary role is oversight rather than daily management of the project. Matrixed support is provided to the RL project manager from the other RL organizations. Summary responsibilities of the RL project manager are as follows:

  - Provide project direction

  - Coordinate and approve overall project documentation and control baselines

  - Monitor and review project activities

  - Ensure compliance with applicable DOE orders and regulatory requirements

  - Provide policy guidance and direction to FDH

  - Maintain a proactive single point of contact for matrix support organizations, federal and state regulatory agencies, and other external stakeholders

  - Coordinate approval of project documentation in RL.

- FH – FH provides project integration across the Hanford Site. The Deactivation & Decommissioning organization within FH has responsibility for integration and performance monitoring for the 324 Building. The following are summary responsibilities for the project manager:

  - Provide integration interface with other onsite contractors to ensure project objectives are not jeopardized because of competing interests/needs

  - Provide management guidance and direction

  - Monitor and review project activities and baselines (cost, schedule, scope)

  - Coordinate approval of project documentation

  - Oversee worker health and safety programs

  - Facilitate resolution of policy issues

  - Develop an integrated plan to accomplish the project objectives in a cost effective manner using demonstrated innovative technology where appropriate

  - Define and administer the technical, cost, and schedule requirements

- Prepare safety analysis reports, environmental analyses, and regulatory analyses and permits needed for project implementation

- Manage and control project baselines, as well as the timely identification and communication of real and potential problems

- Develop proposed corrective actions

- Implement corrective actions

- Provide project status regarding established project baselines

- Perform S&M and deactivation work

- Establish and use an effective review process

- Establish and use an effective work control process

1.7 SUMMARY

All areas of the 324 Building were considered when defining the boundary for the nonpermitted RCRA TSD closure unit (Ecology 1997). This closure plan only addresses TSD activities that have occurred within the closure boundary. The closure plan outlines the path forward for closure of the mixed waste units for Milestone M-89-00. Based on Milestone M-094-03, which requires complete disposition of the 324 Building, the path for closure and the performance standard has changed to performing "removal" instead of cleaning to meet the Debris Rule "clean debris surface" standard for clean closure. Clean closure will be achieved by removing the mixed waste units in parallel with facility disposition and demolition activities. However, where clean closure is not possible, closure surveillance and maintenance activities will be implemented according to Chapter 8.0 of this closure plan.

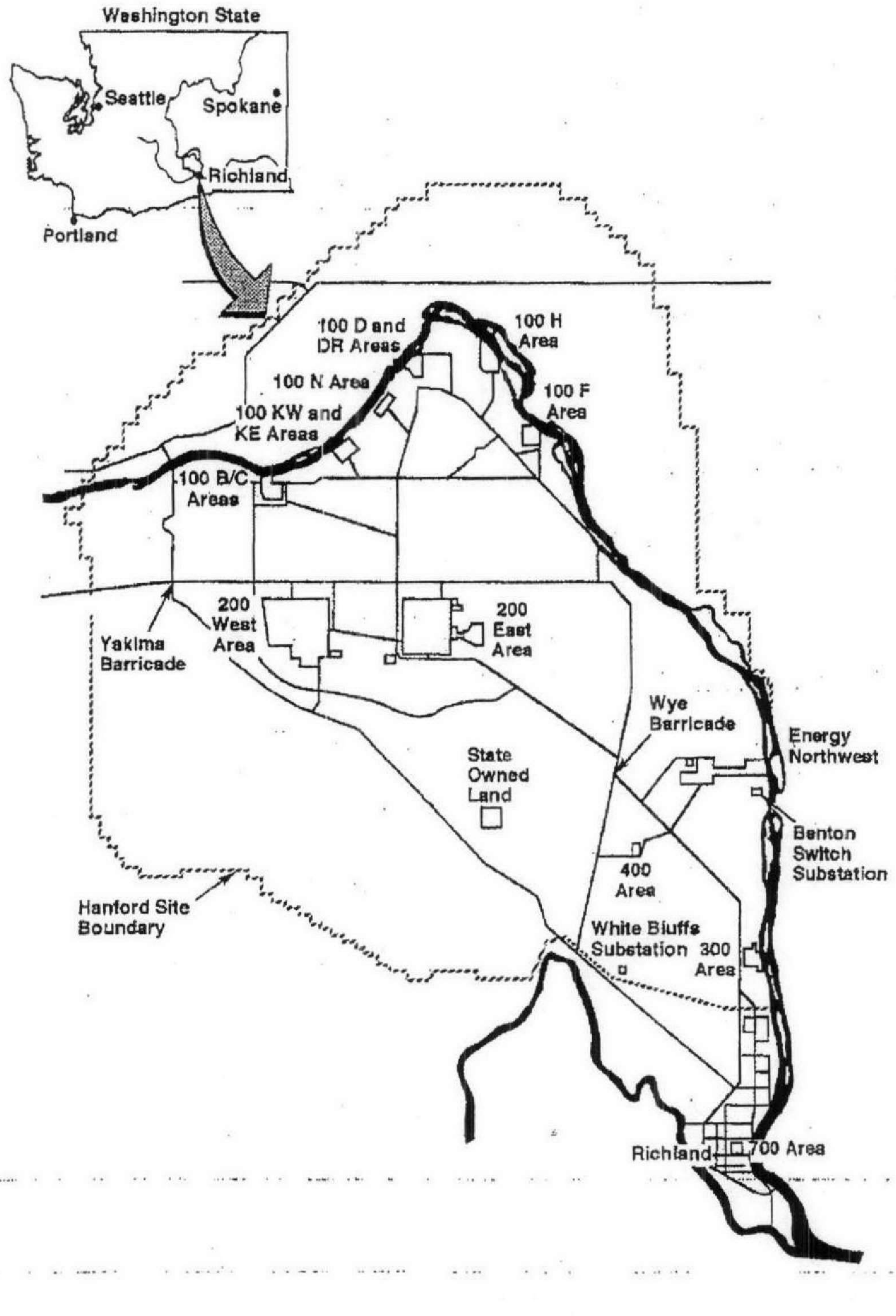


Figure 1-1. Hanford Site.

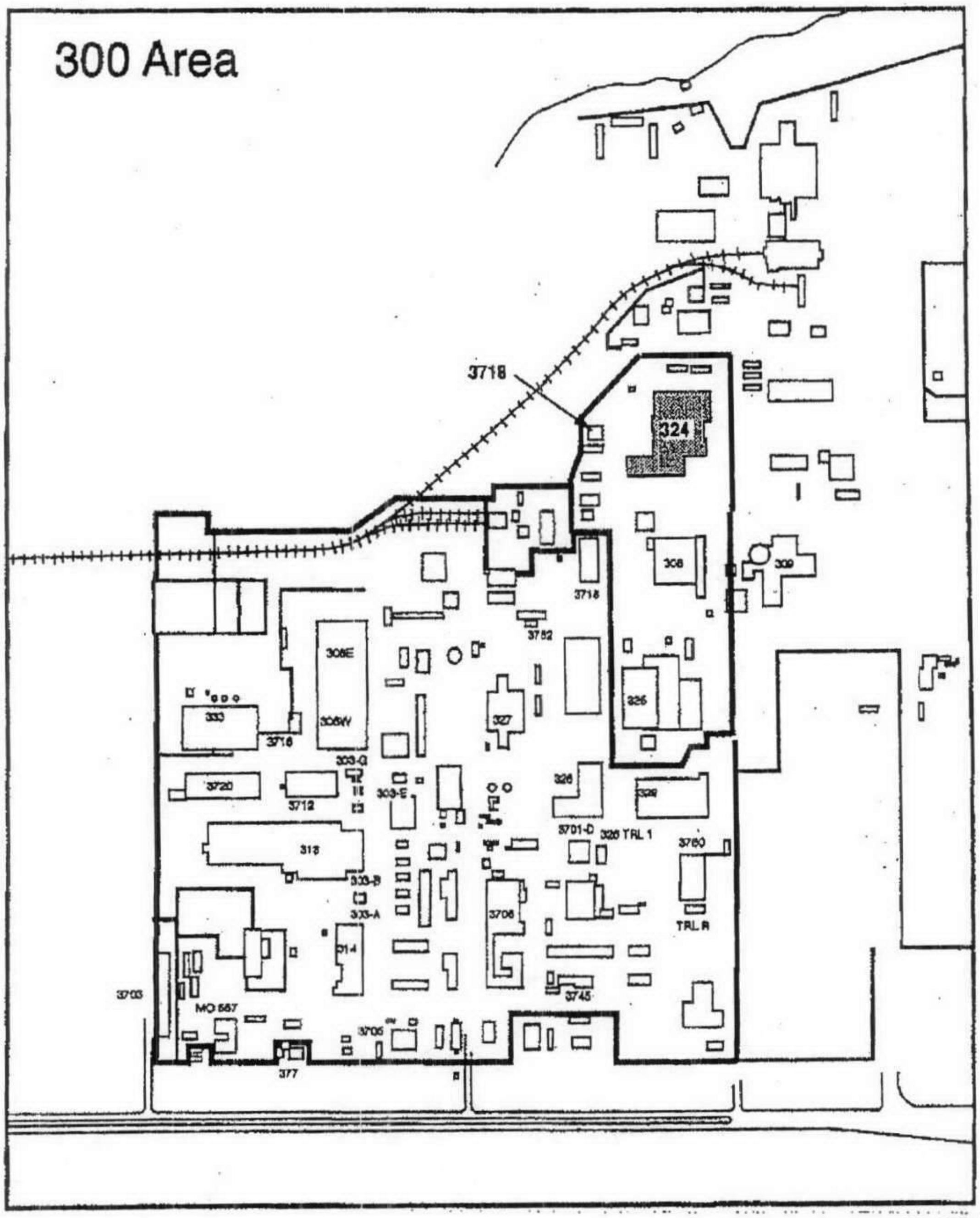


Figure 1-2. 300 Area and Location of 324 Building.

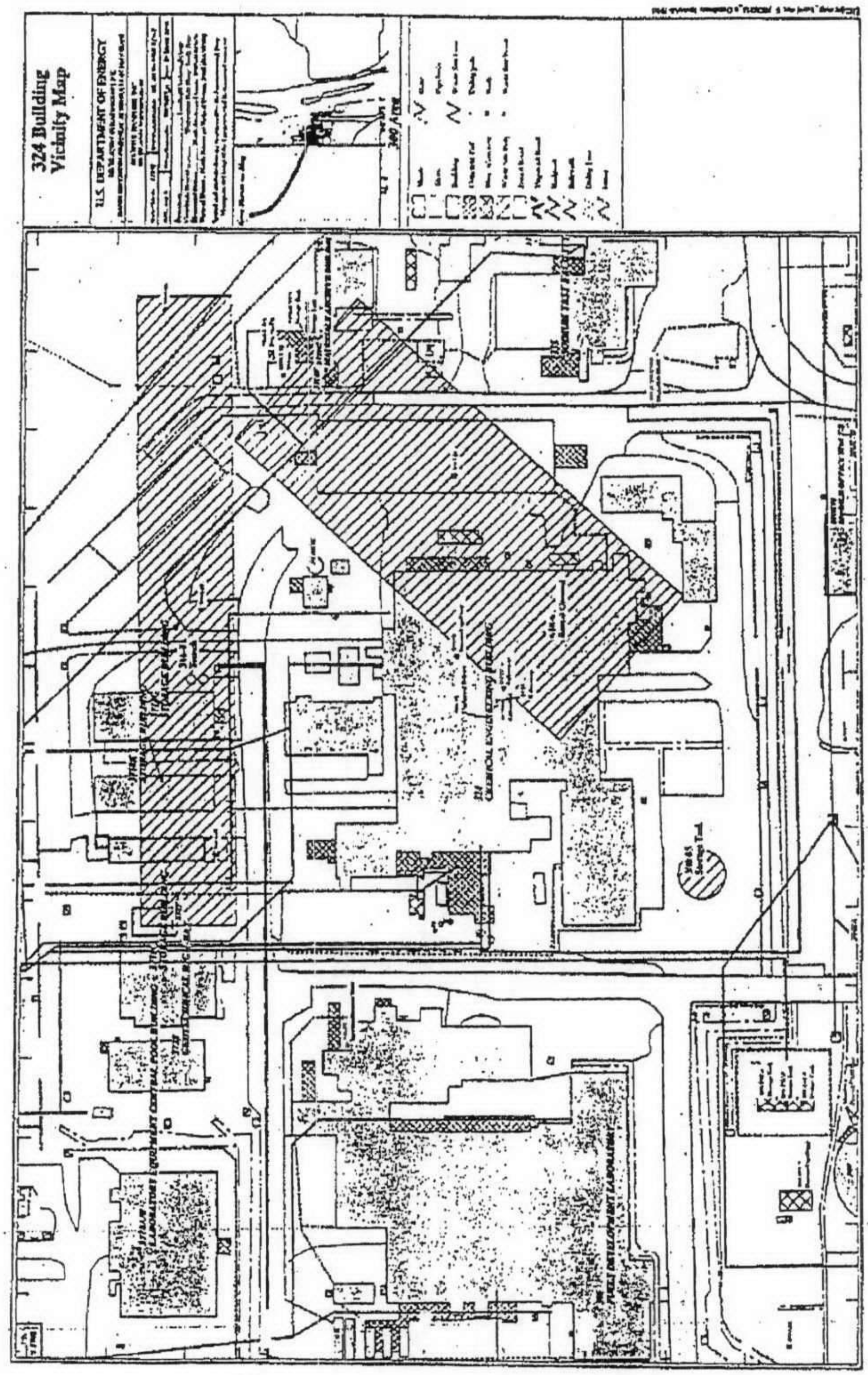


Figure 1-3. 324 Building Construction Site.

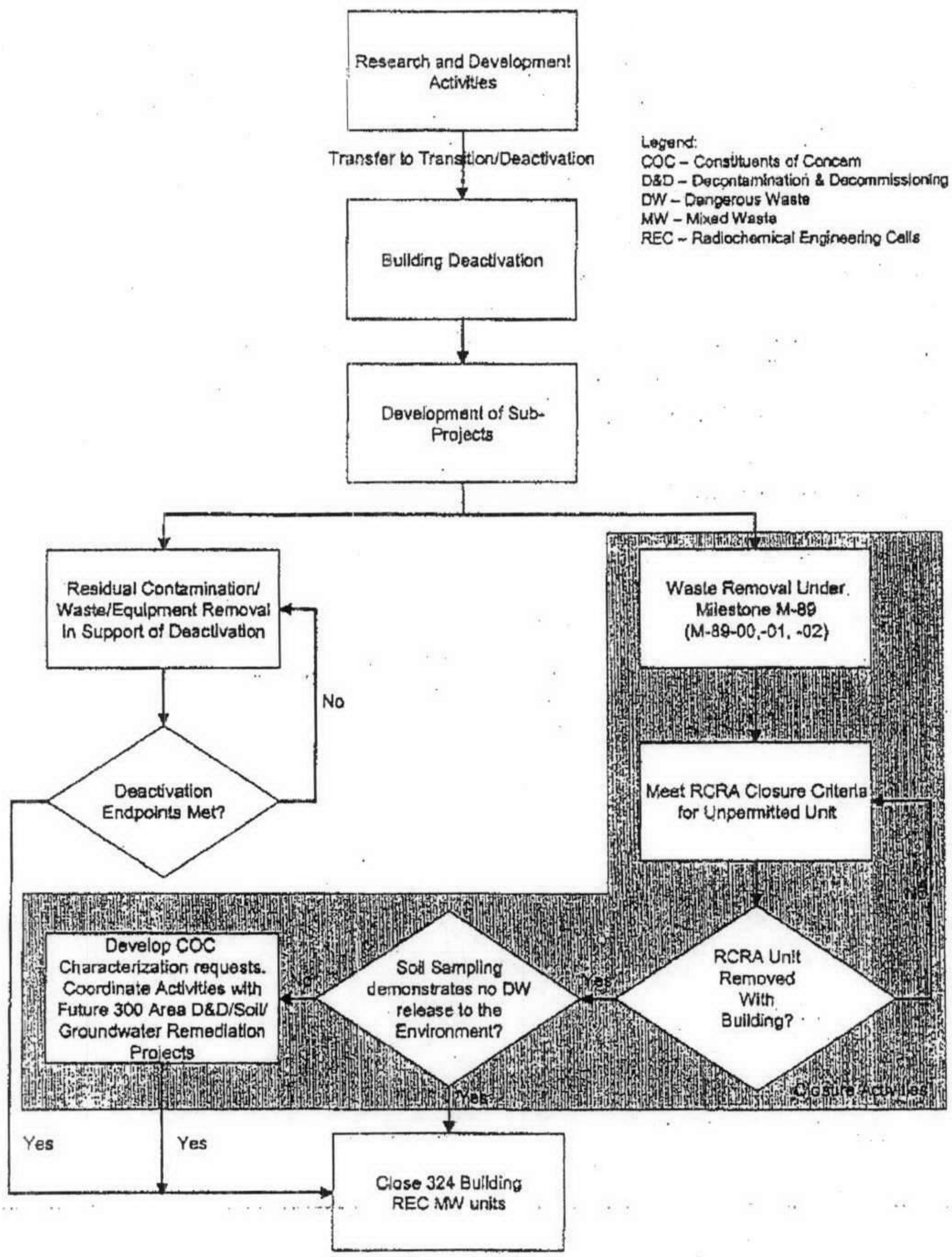


Figure 1-4. Deactivation/Closure Plan Integration.

CONTENTS

APPENDIX

FIGURES

FIGURES (cont)

TABLES

2.0 FACILITY DESCRIPTION

The 324 Building was designed to provide office and laboratory space for scientific and engineering staff who conduct multi-disciplinary research in areas of waste characterization and immobilization, waste remediation and cleanup development, biomass research, spent fuel characterization, tritium development, and cesium chloride encapsulation. Because the 324 Building housed research and development activities, the work being conducted changed as programs were concluded and other programs started.

2.1 GENERAL FACILITY DESCRIPTION

Construction of the 324 Building began in 1964 and was completed in 1965. The 324 Building is a substantial concrete and steel structure. The building has a partial basement and first, second, and partial third floors surrounding the engineering hot cell complex. Accessible floor areas total 9,450 square meters. The foundation structure is poured-in-place steel reinforced concrete.

Typically life expectancy criteria for construction and materials is 20 years, however this is a minimum requirement which is consistently exceeded. Although this time period has expired, and no robust non-destructive examination data for the building structure and materials is available, it is believed that the structure and materials are sound. Daily surveillances of the visible areas would note visible defects or flaws in the structure or equipment.

The roof of the facility is a parapeted, slightly sloped steel deck covered with concrete, gravel finished, Class II, 20 year, built-up roof. The roof is inspected at 5-year intervals. A major reroofing project was completed in late summer of 1995, and is expected to last 20 years. The last roof inspection was performed on August 29, 1997, and was found to meet requirements.

The 324 Building and its components are depicted in Figures 2-1 through 2-6. The 324 Building is divided into four, integrated-but-separate primary work areas: EDL-101 and -102, the EDL-146, the REC, and the SMF. The total floor area is about 6,164 square meters. Maximum overall building dimensions are: 62.5 x 71.6 x 13.7-meters-high. The radiation shielding of the hot cell walls is provided by the thick concrete (1.37 meters normal-density; 1.22 meters high-density). Both the REC and SMF cells provide protection from radiation sources of up to 10^6 R/hr.

The EDL-101 and -102 rooms have been used to perform bench-to-prototype scale engineering studies of waste immobilization processes with nonradioactive materials, depleted uranium, and thorium. EDL-101 also was used to develop sodium and lithium cleaning processes in support of development of the Fast Flux Test Facility. EDL-101 consists of a single room (originally designed as a cold (i.e., nonradioactive) crafts shop to support activities in EDL-102). EDL-102 consists of 16 adjacent 15 x 6.7 x 3.5-meters-high modules with complete crane coverage, and the EDL tank room. The modules were designed to allow combination into eight, two-story modules 6.7-meters-high for large-scale studies. The tank room contained four small tanks, and was designed to allow preparation of feed materials for waste immobilization studies.

The EDL-146 (Figure 2-3) contained unshielded or mildly shielded gloveboxes for studies with extremely toxic materials, tracer level fission products, and/or plutonium. Located within EDL-146 is the sampling room (Room 145), which contains sampling equipment for the HLV and LLV tanks.

The REC provided for studies of almost any type of chemical or mechanical process with radiation levels of up to 10^6 R/hr. The REC consists of four operating cells surrounding a common air lock cell. The airlock functions primarily as a transition zone and ventilation barrier for movement of shielded material between external areas and the four processing cells. The HEPA ventilation system is designed for contamination confinement by managing air flow from non-contaminated areas into increasingly more contaminated areas and the exhaust through double sets of HEPA filters

All of the cells and the airlock are equipped with overhead crane service, lead glass windows that are oil filled to facilitate viewing, and master-slave manipulators to aid remote operation and maintenance of in-cell equipment. The manipulators have a weight limit of about 11.3 kilograms at full extension but do not permit precise manipulation of materials or waste. In C-Cell and D-Cell, the manipulators limited reach does not allow most of the floor to be accessed. In B-Cell and A-Cell, the manipulators do not reach to the floor.

A-Cell is a 10-meter-high cell that was used most recently for storage and characterization of vitrified waste in canisters. A-Cell was used most recently to temporarily store 34 high heat and high radiation vitrified isotopic sources (refer to Chapter 3.0).

B-Cell is a 10-meter-high cell that was used primarily to demonstrate several engineering scale prototypes of waste immobilization processes (refer to Chapter 3.0). B-Cell contained process equipment designed and installed in rack configurations. The racks 'plugged' into the cell walls through specially designed penetrations. The plugs allowed service connections to be made on the 'cold' side of the cell in the service galleries surrounding the hot cells.

The C- and D-Cells are shorter process cells, capable of handling equipment up to 3.35 meters high, and are operated entirely by direct viewing and master-slave manipulators with assistance from remotely operated overhead cranes. Typical processes studied in these cells are dissolution and separation of fuel element compounds by high-temperature gases or liquid salt melts, de-jacketing of fuel elements, remote equipment development, and determination of physical properties of highly radioactive materials or equipment.

The SMF includes the fabrication cell, the airlock cell, and the feed preparation cell. Complete containment of radioactive materials, alpha, beta, and gamma, are provided for remote research and fabrication studies on metallic and ceramic fuel materials with radiation levels also on the order of 10^6 R/hr.

The cask handling area is the central hub for control of radioactive material movements within the regulated areas of the building. This area is centrally located adjacent to the REC and their operating galleries, the SMF cells and their galleries, EDL-146, and the regulated (manipulator repair) shop (Room 147). A trucklock provides for shipping and receiving. Material transfers between the functional areas are routed through the cask handling area. The cask handling area is serviced by a 27.2-metric-ton, direct current-powered crane equipped with an auxiliary hoist with a 4.5-metric-ton capacity. Facilities exist for load-in and load-out of large quantities of radioactive materials to any cell or to the shielded vault area through equipment in the trucklock and cask handling areas.

A wet storage basin was centrally positioned in the cask handling area for underwater storage of radioactive materials, fuel elements, and the unloading of fuel casks. Shielded transfer of highly radioactive materials from the wet basin to either cell complex was provided by remotely operated, mechanical transfer conveyors. The wet basin has been decommissioned, filled with sand, and covered with concrete.

Two shielded vaults (the HLV and LLV), containing stainless steel tanks ranging from 1,700 liters to 18,500 liters, were provided for temporary segregation and hold-up of radioactive liquid feedstocks for, or waste from, chemical processing and/or cleaning operations in the hot cells.

The four REC hot cells (A-Cell, B-Cell, C-Cell, and D-Cell) surround the REC airlock cell, located at the junction of the T-shaped complex. The two SMF hot cells are adjacent to the SMF airlock cell, located at the junction of the L-shaped complex. The airlocks function primarily as a transition zone and ventilation barrier for movement of radioactive materials in shielded packages between the unshielded areas and the shielded hot cells.

The remainder of the 324 Building consists of offices, lunchroom, change rooms, and ancillary laboratory spaces. These areas are used to provide administrative support, development laboratories, maintenance shops, and common facility service and support areas.

2.2 CLOSURE UNIT BOUNDARY AGREEMENT

The closure boundary was developed using the data quality objective process to assess how much and what type of data are needed to allow decisions on closure to be made. This section discusses the overall closure boundary and the agreements made on the various components within the closure boundary (Table 2-1). Section 2.3 discusses in detail the as-is condition, relevant construction and operational data, and specific closure unit components. For completeness and to ensure that all areas of the 324 Building were considered for closure requirements detailed record searches and reviews were conducted. Section 2.3 provides data on areas within the closure boundary. Other areas within the 324 Building are outside the scope of this closure plan.

The closure unit boundary includes all the cells in the REC and the REC airlock, the HLV, the pipe trench that contains piping interconnecting the HLV tanks to the REC Cells, the LLV, the trucklock, the cask handling area, the sample room (Room 145), the EDL-146, and the galleries. Figures 2-2 through 2-5 identify the closure unit boundaries.

Within this boundary, only the following portions require closure actions: (1) the B-Cell; (2) two portions of the D-Cell, including the adsorbed waste mineral oil container storage area and the HLV liquid treatment process equipment; (3) the airlock; (4) the pipe trench; (5) HLV; (6) LLV; (7) HLV sample room (Room 145); (8) EDL-146; (9) the operating galleries (including Room 18); and (10) the piping system. The strategy and activities required for closure of these portions of the 324 Building are detailed in Chapters 6.0 and 7.0, respectively. Section 2.3 provides a general physical description of the portions of the 324 Building that are included in the closure boundary.

Additionally, Ecology and RL have agreed (Ecology and DOE-RL 1997) that the ventilation system is not included in the closure and that the system will remain operational under Washington State Department of Health (WDOH) direction and compliance requirements, as appropriate, until the ventilation system is no longer needed to support deactivation and closure activities. The 324 Building deactivation PMP currently has draft endpoints established to shutdown the ventilation system.

2.3 CLOSURE UNIT DESCRIPTIONS

The following sections provide a detailed description of the portions of the 324 Building that are included in the closure boundary, provide construction and operational details, and identify the closure unit components.

2.3.1 Radiochemical Engineering Cells

The REC (Figures 2-1 through 2-5 and 2-7) consists of four hot cells (A, B, C, and D), a central airlock, and a pipe trench. The cells and airlock are joined to form a T-shaped structure. D-Cell is located above the C-Cell on the south side. C-Cell/D-Cell, the airlock, and the A-Cell form the top of the T-shape. B-Cell connects to the airlock to form the bottom of the T-shape. The walls are constructed of 1.2-meter-thick, high-density concrete or 1.4-meter-thick, normal-density concrete. This concrete is used as containment and radiation shielding.

The hot cells in the REC complex provide for process engineering and testing of highly radioactive materials. The airlock functions primarily as a transition zone and ventilation barrier for the transfer of highly radioactive material in shielded overpacks between the unshielded cask handling area and the four shielded hot cells.

The larger A-Cell and B-Cell function as general purpose processing cells and were operated using remote equipment from the operating galleries. A semi-remote maintenance technique grouped process equipment into racks that 'plug' into the cell walls, and allow access to service connections on the 'cold' side for contact maintenance. Certain in-cell items are remotely operated and maintained using direct viewing through lead glass-oil filled windows supplemented by closed-circuit television and manipulators. Process connections also are made on the 'cold' side in a shielded pipe trench by semi-remote means. Process connections included general services such as electrical, compressed air, instrumentation, etc., and piping connections to the HLV and LLV tanks. As mentioned previously, these tanks held process feed solutions, interim product, and process waste solutions.

Operations in the REC are performed remotely, so that remote experiments could be performed in-cell. Each cell is equipped with remote/mechanical manipulators; remotely operated cranes; remote viewing equipment; and 1.2-meter-thick leaded glass viewing windows filled with mineral oil, which acts as an optical clarifier.

The remote viewing system consists of a portable video camera equipped with a zoom lens and the ability to record video images. The camera system is hardened for high radiation environment. Cameras in some areas can also provide color images. The video coverage and camera movement in the cells are accomplished using the overhead cranes located in the cells.

2.3.1.1 A-Cell Description

REC A-Cell (Room 136) is located adjacent to and north of the REC airlock (Room 135). Access into A-Cell is through a swinging shield door located in the airlock on the north wall. Penetrations into A-Cell include ventilation ducts, manipulator sleeves, and electrical cables. Two leaded-glass, oil-filled shielding windows provide visual access into the cell. Associated with each window is a pair of remote/mechanical manipulators that provide remote handling access into the A-Cell. The cell has a 9.1-metric-ton remote-operated bridge crane.

A-Cell (Figures 2-3 and 2-7) is 2.8 meters long, 6.4 meters wide, and 10 meters high. The floor of the cell is located at the first floor level. The floor is lined with 0.32-centimeter stainless steel plate that is welded at the seams. Under the floor plate is a 15-centimeter-thick slab of concrete, and under the concrete floor is a crawlspace and packed native soil. Waste transfer piping (from the pipe trench to the HLV tanks) is embedded in the concrete floor. Cell access is through a door into the airlock. Walls are constructed of normal-density concrete and other shielding materials (i.e., steel and concrete blocks) to protect personnel from the radiation sources in the cells. Normal services into A-Cell include electricity, water, and compressed air. There are 43 shielded penetrations in the liner to provide for addition of process accessories.

The following equipment is known to be in the REC A-Cell; all of this equipment is scheduled to be removed.

- 1 electropolishing tank
- 1 power supply rack
- 1 canister storage rack (used to contain 34 Federal Republic of Germany canisters)
- 1 anode grappler
- 1 407.7-kilogram dumb bell
- 1 37.7-liter stainless steel 10 gauge container (previously used to store manipulator sleeves, plastic, etc., subsequently emptied)
- Helium leak test fixture on the wall of the cell
- Canister transport fixture on the cell door.

2.3.1.1.1 Construction and Operational Detail

REC A-Cell is constructed of normal-density concrete. The north wall is constructed of 1.37-meter-thick normal-density concrete. East and west walls are constructed of normal-density concrete, varying from 1.37-meters to 1.82-meters thick. The south wall is constructed of 1.22-meters-thick normal-density concrete. The interior A-Cell floor is lined with stainless steel. The walls are lined with 0.6-centimeter-thick mild steel plate. The plate is butt-welded and ground to a smooth finish. The stainless steel floor line is seam welded to the mild steel plate, approximately 5.1 centimeters above floor level. The wall liner extends to the height of the crane rails (68.6 centimeters). A 7.6-centimeter band of epoxy resin was applied at the top of the wall liner during construction. REC cell floors are lined with 0.32-centimeter stainless steel. The floors are sloped toward sumps provided with liquid-level indication instrumentation and steam jets for removing accumulated liquid. Under the cells is a solid foundation and a ventilation duct space that houses exhaust ducts carrying air from the cell to the first stage of HEPA filters. The cells are ventilated, and instruments and accessible components are checked daily. Air is drawn through cell wall penetrations and ventilation inlets. Cell pressure is maintained lower than the surrounding galleries to prevent the migration of contamination into the operating gallery. Exhaust air passes through at least two stages of HEPA filtration before exiting through an EPA/WDOH regulated point source emission unit (stack). Alarms and instrumentation are maintained through a periodic preventative maintenance recall system in addition to corrective actions initiated during operator rounds and operations.

The A-Cell liner was installed at the time of construction of the REC hot-cells. The liner floor is constructed of 0.32-centimeter-thick seam welded stainless steel plate. The walls are lined to the ceiling with mild (carbon) steel that is painted. Mild steel was used rather than stainless because the cell was originally designed to test fission gases (i.e., iodine) that are corrosive to stainless steel. The ceiling is painted concrete. The A-Cell liner has 43 engineered penetrations ranging from 1 meter to 8.5 meters above the floor. The cell was designed and constructed as a primary containment structure for highly radioactive waste (liquid and sludge). There was no integrity assessment documentation available for the original welds, nor was there a periodic nondestructive examination program to determine the integrity of the liners. There has been no indication of corrosion or unplanned penetrations on the cell liner noticed during the recent cell work to remotely remove high heat source vitrified containers.

2.3.1.1.2 Closure Unit Components

As shown in Table 2.1, there are no components within A-Cell requiring closure. Waste piping under A-Cell (in the A-Cell crawl space) will require closure. Access to the crawl space will be evaluated during completion of closure unit activities. Further details for closure activities are provided in Chapter 7.0.

2.3.1.2 B-Cell Description

B-Cell (Figures 2-2, 2-7, and 2-8) is the largest of the four hot cells, measuring 7.6 meters long, 6.7 meters wide, and 9.3 meters high. The floor of the cell is located at approximately the basement level, 3.05 meters below grade. The floor and the walls are lined up to 8.2 meters high with 0.32-centimeter-stainless steel plate that is welded at the seams. Under the floor liner is a slab of concrete varying from 15.2 to 30.5 centimeters in thickness, and under the concrete is packed native soil. The cell walls are made of 1.5-meter-thick high-density concrete from the floor up to the 0.0 level (cell walls in Room 18), thinning to 1.2-meters-thick from 0.0 level up to the ceiling (0.0 level is the first floor level). The cell is surrounded on three sides by operating galleries on the first and second floors and on two sides by a gallery (Room 18) at the basement level. The east side of the cell adjoins the airlock.

Numerous cell wall penetration sleeves, stepped for shielding purposes, are used to provide piping and electrical services to in-cell equipment. Penetrations for services, such as manipulators and electrical cables, are not completely sealed, but rather rely on the negative pressure in the cell to prevent escape of contamination. Ventilation inlets initially were designed and installed with low-efficiency filters (dust stops), but those filters admitted particulate matter from the outside, some of which settled to the floor as it entered the slower moving air in the cell. In April 1994, HEPA filters were installed to minimize the amount of dust entering the cell. The HEPA filters remove at least 99.97 percent of 0.3-micron-size particles. Air leaving B-Cell passes through an electrostatic precipitator upstream from a bank of in-cell HEPA filters. The air exhaust passes through two additional banks of HEPA filters before leaving the building.

Two cranes service the cell and allow material movement between B-Cell and the airlock cell. Three oil-filled lead glass viewing windows are located on the first floor, and two viewing windows are located on the second floor. The first floor windows each have two adjacent remote/mechanical manipulators that allow remote manipulation and maintenance of the in-cell equipment.

The following equipment is known to be in the REC B-Cell. All of this equipment is scheduled to be removed. This equipment is described in detail in Chapter 3.0, Section 3.3.2:

- Three large equipment racks (1A, 1B, and 2A)
- Three in-cell process service tanks (Tank 112, Tank 114, and Tank 118)
- An evaporator tank (Tank 113)
- An acid fractionator tank (Tank 115)
- Associated ancillary equipment and piping.
- Two temporary fuel storage racks
- Special Case Waste (SCW) and mixed waste storage rack
- A fuel pin storage container
- Fuel thimbles used to transport and store spent fuel assemblies
- 2,265-kilogram steel block
- Sump trench cover screen
- West window work tray.

The two fuel storage racks currently house the light waste reactor (LWR) spent fuel assemblies (located within fuel assembly thimbles) and the fuel pin storage container containing 17 intact fuel pins. The fuel storage racks are temporary racks located on either side of the west window of B-Cell. The SCW container rack currently contains the containerized dispersibles. A 114-liter fuel pin storage container is used to house approximately 16 rod-equivalent boiling water reactor (BWR) and pressured water reactor (PWR) Spent Nuclear Fuel (SNF) segments, and 21 kilograms of PWR fuel pellet fragments (>7.6 centimeters in length).

2.3.1.2.1 Construction and Operational Detail

B-Cell floor was constructed with a two percent slope from the high point along the west side to the low point on the east side. The cell was designed so that any liquid that reaches the floor flows across the floor to a trench that runs the length of the east side, which is sloped to a sump in the northeast corner beneath the 2A Rack. Liquid jetted from the B-Cell sump was transferred to the HLV tanks via the pipe trench. The sump jet ceased operating in 1979, and due to inaccessibility, was not replaced. Because of the placement of the 1A, 1B, and 2A Racks, inspection of the status of the collection trench and sump is not possible. However, the cell was designed to have a sump alarm that annunciates if excess liquid accumulates. No documentation was found that the sump alarm was ever turned off or otherwise made inoperable. The sump alarm is designed to function through monitoring pressure differences caused by increases in the liquid level present in the sump. Differential pressure transmitters located in the second floor gallery area are serviced routinely to ensure working order. The alarm is set to indicate the presence of liquid at a pre-set level (typically 2.5 centimeters to 5 centimeters of liquid). Therefore, it is possible to have liquid present in the sump below the setpoint of the instrumentation while the alarm is operational.

The processing activities in B-Cell included some high temperature processing steps that could have allowed some process effluents to be consecutively transported to the relatively cool ceiling and be condensed. Although the down draft design of the in-cell ventilation was expected to minimize this effect, the inlet air ducts in the ceiling did not coincide with the position of the underlying high temperature equipment enough to be totally effective.

B-Cell is lined with 0.32-centimeter stainless steel. The cell has a solid foundation, is protected from the environment, is ventilated, and the instruments and accessible components are checked daily. Air is drawn through cell wall penetrations and ceiling ventilation inlets. Cell pressure is maintained lower than the surrounding galleries to prevent the migration of contamination. Exhaust air passes through at least two stages of HEPA filtration before exiting through an EPA/WDOH point source emission unit (stack).

Alarms and instrumentation are maintained through a periodic preventative maintenance recall system in addition to corrective actions initiated during operator rounds and operations. In-cell liquid alarms and instrumentation are designed to function through monitoring pressure differences caused by increases in the liquid level in the sump or vessel.

The B-Cell liner was installed at the time of construction of the REC hot cells. The liner was constructed with 0.32-centimeter stainless steel plate, seam welded, and covers the floor and 8.2 meters up the walls. At the top, the concrete wall was slotted and the liner plate was folded and epoxyed in place in the slot to form a waterproof flashing to prevent liquid from entering behind the liner. The remaining walls and ceiling are painted concrete. The B-Cell liner has 89 engineered penetrations located at a minimum height of 1 meter and maximum height of 8 meters. The hot cells were designed and constructed as a primary containment structure for highly radioactive waste (liquid and sludge). There was no integrity assessment documentation available for the original welds, nor was a periodic nondestructive examination program for determining the integrity of the liners. In addition, the floor liner could not be inspected because it was covered by the large process racks and dirt/debris.

It should be noted that as designed, the stainless steel liner ran up the wall to the concrete ledges that hold the crane rails. Angle iron 'flashing' was installed at the junction between the crane rails and the top of the stainless liner. The flashing is sealed and bolted in place. This flashing completes the effective seal of the cell, and prevents decontamination solutions or deluge water from running between the concrete wall and the stainless steel liner.

2.3.1.2.2 Closure Unit Components

The components requiring closure in B-Cell are the stainless steel liner and surrounding concrete (Table 2-1). The excess in-cell equipment and dispersible debris (including all mixed waste) are being removed in accordance with the M-89-02 Milestone. B-Cell cleanout is an ongoing project, which is detailed in Chapter 3.0, Section 3.3.2.

2.3.1.3 C-Cell Description

C-Cell is located directly below D-Cell in the south leg of the REC 'T' (Figures 2-3 and 2-7). The floor of the cell is at the first floor building level. The C-Cell is 5.9 meters long, 3.7 meters wide, and 4.6 meters high. The floor is lined with 0.32-centimeter-stainless steel plate welded at the seams. Under the floor plate is a 15-centimeter-thick slab of concrete and under the concrete floor is a crawl space and packed native soil. The cell is adjoined to the north by the airlock. The cell access is provided by a door to the airlock. Shielding walls are constructed of 1.2-meter-thick high-density concrete. Normal services into C-Cell include electricity, water, and compressed air.

C-Cell is adjacent to and south of the REC airlock (Room 135). Access into C-Cell is via the Airlock through two openings. A pass-through is capable of handling articles up to 46 centimeters wide and 46 centimeters high. It is equipped with hinged 15-centimeter thick steel and lead shielding doors on the inside and outside surfaces of the cell wall. Larger articles, up to 1.8 meters wide by 2.4 meters high, can be moved through the C-Cell shield door. In addition, articles can be introduced to, but not removed from C-Cell through a small 10.2-centimeter diameter pass-through in the front facing wall. A removable block (0.9 m by 1.2 m) is located in the C-Cell ceiling to allow transfers between C-Cell and D-Cell. C-Cell was designed to be a multipurpose cell for laboratory and engineering scale radiochemical experimentation.

Two leaded-glass, oil-filled shielding windows provide visual access into the cell. Associated with each window is a pair of remote/mechanical manipulators that provide remote-handling capability in the cell. The C-Cell also is equipped with a 1.8-metric-ton remote-operated bridge crane and a power-assisted robotic manipulator.

Cell lighting consists of mercury vapor lighting lamps. These fixtures are positioned along the wall above the cell windows.

The following equipment is known to be in C-Cell:

- Sludge pretreatment system (currently operational)
- A metal fold down ladder
- 1.8-metric-ton bridge crane (dedicated to C-Cell)
- Camera
- Pneumatic arm
- Periscope
- Hand tools
- A work table.

2.3.1.3.1 Construction and Operational Detail.

C-Cell is constructed of concrete. The ceiling is 0.9-meters-thick concrete with one removable block 0.9-meter by 1.2-meter, located on the north side of the cell to allow transfer of equipment from D-Cell. The short east and west walls are normal-density concrete varying in thickness from 1.4 meters to 1.8 meters thick. The north wall is of 1.4-meters-thick normal-density concrete. The south wall is of 1.2-meters-thick high-density concrete. The floor is of 0.61-meter-thick high-density concrete. Process lines are embedded in the concrete floor. The interior C-Cell floor is lined with stainless steel seam welded plate; interior walls also are lined from floor to ceiling with stainless steel seam welded plate. The exterior walls are painted concrete. C-Cell is equipped with one sump located in the southwest corner of the cell. A collection trench runs along the south wall of the cell. The floor of the cell is sloped to the sump. In 1995, the sump was sealed closed by welding a stainless steel plate to the floor. The collection trench is still functional.

C-Cell has a solid foundation, is protected from the environment, is ventilated, and the instruments and accessible components are checked daily. Air is drawn through cell wall penetrations and ventilation inlets. Cell pressure is maintained lower than the surrounding galleries to prevent the migration of contamination. Exhaust air passes through at least two stages of HEPA filtration before exiting through an EPA/WDOH, regulated point source emission unit (stack). A ventilation crawl space with a packed native dirt floor under the C-Cell floor slab allows routing of the airlock exhaust plenums to the first stage of HEPA filtration.

In addition, service piping manifolds are located on the east and west walls of the cell. The manifolds consist of flanges or block connectors attached to piping that is embedded in the concrete wall. The piping consists of steam, water, and vacuum lines.. Additionally, extra service lines are present that can provide interconnection to other REC Cells for the transfer of solutions. All of these lines, as well as lines servicing D-Cell, are embedded in the concrete walls and floor of the cell.

Alarms and instrumentation are maintained through a periodic preventative maintenance recall system in addition to corrective actions initiated during operator rounds and operations.

The C-Cell liner was installed at the time of construction of the REC hot cells. The liner was constructed with 0.32-centimeter-thick stainless steel plate, seam welded, and covers the floor, walls, and ceiling. The ceiling has a 0.9-meter by 1.2-meter removable block to allow transfer of equipment into the cell using the D-Cell crane. The C-Cell liner has 21 engineered penetrations located at a minimum height of 1 meter and maximum height of 4 meters. The hot cells were designed and constructed as a primary containment structure for highly radioactive waste (liquid and sludge). There was no integrity assessment documentation available for the original welds, nor was there a periodic nondestructive examination program to determine the integrity of the liners.

2.3.1.3.2 Closure Unit Components

As shown in Table 2.1, there are no components within C-Cell requiring closure.

2.3.1.4 D-Cell Description

D-Cell is located directly above C-Cell in the south end of the REC 'T' (Figures 2-5 and 2-7). The floor of the cell is between the first and second floor levels. D-Cell is 6.1 meters long, 3.7 meters wide, and 4.9 meters high. The floor is lined with 0.32-centimeter-thick stainless steel, and the walls are lined with mild steel. The cell is adjoined by the airlock and by the second floor service gallery on the south side.

There is a door between the cell and the airlock. Walls are constructed of 1.4-meter-thick, normal-density concrete and uses other shielding materials (i.e., steel) to protect personnel from the radiation sources in the cell. Normal services into D-Cell include electricity, water, and compressed air. Services are provided through embedded piping in the east and west walls of the cell. Piping also includes unused service lines that can be used to provide connection to other REC Cells for the transfer of solutions or small process ventilation.

D-Cell is located adjacent to and south of the REC airlock. D-Cell is situated directly above the C-Cell with a 0.6-meter-thick floor slab in between. A removable block in the floor allows egress to C-Cell below. Access into the D-Cell is through a swinging shield door located in the airlock on the south wall or through a transfer port that provided an airlock for a glovebox originally installed in the D-Cell gallery area. A small 7.6-centimeter pass-through port is available for transfers of materials into or out of the cell. A pass-through penetration that was never used, is present in the west wall of the cell. The penetration is shielded with concrete bricks and covered with a steel access plate on the gallery side of the wall.

D-Cell is similar to the other REC cells and has two shielding windows, four remote/mechanical manipulators, a remote viewing periscope, and closed-circuit television. D-Cell shares a 4.5-metric-ton adjacent to each remote operated bridge crane with the airlock and A-Cell. D-Cell lighting consists of a mercury vapor lamps installed at each window on the cell interior. D-Cell has a sump in the southwest corner of the cell. There is no documentation of any process upset that resulted in the accumulation of liquids in the sump.

In addition to the SNF, HLV filters, and ion exchange columns, the following equipment is known to be in D-Cell:

- HLV skids 1 and 2
- HLV skid spreader bar
- Two spent fuel storage containers with full length and segmented fuel sections
- A lead cave containing two balances
- One cell periscope
- Mark 42 sample fines
- One wall-mounted power-assisted robotic manipulator
- Two 19-liter buckets of nonregulated waste
- Miscellaneous hand tools, electrical cords, electrical junction box, impact wrench, empty tubing and piping, wire and nylon slings, and lifting hooks
- One mini-grout container with waste (nonregulated)
- 38 empty lengths of 4.3-meter-long tubing designed to contain spent fuel rod segments.

D-Cell is used primarily for engineering development work involving highly radioactive materials and waste. D-Cell currently contains some contaminated process equipment.

2.3.1.4.1 Construction and Operational Detail

D-Cell is constructed of concrete. The short east and west walls are constructed of 1.7-meter-thick normal-density concrete. The west wall has a 'soft plug' area 0.76 meters wide by 0.91 meters high that is shielded with concrete bricks, and covered with a steel access plate on the gallery side. The north wall is constructed of 1.4-meter-thick normal-density concrete. The long south wall is constructed of 1.22-meter-thick high-density concrete. The floor is constructed of 0.91-meter-thick high-density concrete. An equipment access hatch 0.91-meters by 1.22-meters is present on the north side of the cell floor. The hatch allows transfer of equipment to C-Cell using the D-Cell crane. The interior D-Cell floor is lined with stainless steel. The D-Cell interior walls are lined from the floor to ceiling with mild (carbon) steel with welded seams. The wall liner is seam welded to the floor liner about 5.08 centimeters above the floor, The mild steel liner is epoxy-sealed to the concrete wall at the crane rail height.

The floor is sloped towards a sump provided with leak detection, liquid level indication instrumentation, and steam jets for removing accumulated liquid. D-Cell is protected from the environment, is ventilated, and the instruments and accessible components are checked daily. Air is drawn through cell wall penetrations and ventilation inlets. Cell pressure is maintained lower than the surrounding galleries to prevent the migration of contamination. Exhaust air passes through at least two stages of HEPA filtration before exiting through an EPA/WDOH point source emission unit (stack).

Alarms and instrumentation are maintained through a periodic preventative maintenance recall system, in addition to corrective actions initiated during operator rounds and operations.

The D-Cell liner was installed at the time of construction of the REC hot-cells. The liner was constructed with 0.32-centimeter-thick stainless steel plate, seam welded, and covers the floor. The walls are lined to the ceiling with mild (carbon) steel welded at the seams. The walls are painted. The ceiling is painted concrete. The D-Cell Liner has 21 engineered penetrations located at a minimum height of 1 meter and maximum height of 4 meters. Although the hot cells were designed and constructed as a primary containment structure for highly radioactive waste (liquid and sludge), there was no integrity assessment documented in evaluation of the original welds, nor was there a periodic nondestructive examination program for determining the integrity of the liners.

2.3.1.4.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure in D-Cell are the removal of the installed equipment associated with the storage and treatment of waste materials from the HLV tanks (Chapter 3.0, Section 3.3.9), followed by visual inspection of the stainless steel liner and surrounding concrete. The removal of this equipment will be performed in accordance with Chapter 7.0, Section 7.1.4. It is anticipated that this equipment will be used to support liquid waste processing of decontamination solutions generated during deactivation activities.

2.3.1.5 Airlock Description

The REC airlock is used primarily as a transition area for transfer of material and equipment into and out of the adjoining cells. Cask transfers between the airlock and the cask handling area are performed using a powered cask dolly.

The airlock is located at the junction of the arms of the REC 'T' (Figure 2-7) and is 6.7 meters long, 6.6 meters wide, and 10 meters high. The floor and the walls up to 8.2 meters high are lined with stainless steel plate welded at the seams. The airlock adjoins A-Cell (north), B-Cell (west), and C-Cell/D-Cell (south), and the cask handling area (east). Access to these areas is via large steel doors equipped with interlocks to prevent unintended opening. The airlock is equipped with cranes that facilitate remote installation, maintenance, and operation of equipment. Shielding walls are constructed of 1.4-meter-thick normal-density concrete.

Access to the REC airlock is through two swinging doors, hung one above the other, sharing a single opening to the cask handling area. The doors are constructed of stepped steel that is at least 0.3 meters thick; the lower door has a 30-centimeter-square lead-glass shielding window. Large pneumatic cylinders provide the driving force to open and close the doors. The doors are not specifically fire-rated. However, because of the thickness and fire resistance, the doors will help limit the spread of fire into adjoining areas.

One lead-glass, oil-filled shielding window is located in the east wall of the airlock. Associated with the window is a pair of remote/mechanical manipulators that provide remote access into the airlock.

Penetrations into the airlock include a cask access port, ventilation duct, manipulator sleeves, and electrical cables. These services are not completely sealed but rely on the negative pressure in the airlock to limit escape of contamination. Under normal operating conditions, the pressure differential between the interior and exterior of the airlock creates a constant sweep of air from the cask handling area through the penetrations into the airlock, thereby maintaining contamination control.

Mercury vapor and incandescent lights are installed in the airlock. The types of portable furnishings stored in the airlock include several large tables and a ladder that leads to the service platform.

2.3.1.5.1 Construction and Operational Detail

The airlock is constructed of concrete. The interior airlock floor is lined with stainless steel. The floor outside the airlock (i.e., the cask handling area floor) is painted concrete. The airlock interior walls are lined from the floor up to 8.2 meters with stainless steel. The remainder of the walls and the ceiling are painted concrete.

The REC airlock also is equipped with the following items:

- One, 0.680-metric-ton remote-operated jib crane with a camera mounted on the boom
- Two remotely-operated 4. 5-metric-ton bridge cranes that also serve A- and D-Cells
- A material and equipment transfer system that includes an electric tugger, dollies, and nine sections of track
- Several work tables
- The pipe trench pump.

The airlock is lined with 0.32-centimeter stainless steel. The floors are sloped toward the pipe trench. The airlock has a solid foundation, is protected from the environment, is ventilated, and the instruments and accessible components are inspected daily. Air is drawn through cell wall penetrations and ventilation inlets. Airlock pressure is maintained lower than the surrounding galleries to prevent the migration of contamination. Exhaust air passes through at least two stages of HEPA filtration before exiting through an EPA/WDOH regulated point source emission unit (stack). A crawl space with a packed native dirt floor located under the concrete floor of the airlock allows routing of the airlock exhaust plenums to the first stage of HEPA filtration. The area is used to provide for chaseways for ventilation supply/exhausts from the hot cells and process and waste transfer lines. No waste management activities have taken place in this area.

Alarms and instrumentation are maintained through a periodic preventative maintenance recall system in addition to corrective actions initiated during operator rounds and operations.

The airlock liner was installed at the time of construction of the REC hot-cells. The liner was constructed with 0.32-centimeter stainless steel plate, seam welded, and covers the floor and 8.2 meters up the walls. The remaining walls and ceiling are painted concrete. The ceiling is painted concrete. Although the REC was designed and constructed as a primary containment structure for highly radioactive waste (liquid and sludge), there was no integrity assessment documentation evaluating the original welds, nor was there a periodic nondestructive examination program for determining the integrity of the liners. Despite this, there was no indication of corrosion or unplanned penetrations of the airlock liner noticed during the recent cell work to remotely remove high-heat source vitrified containers.

2.3.1.5.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure will be those that isolate piping associated with the HLV/LLV tanks that are beneath the airlock. The removal of equipment and the deactivation of the airlock will be performed in accordance with the 324 Building deactivation plan.

2.3.1.6 Pipe Trench

The pipe trench was used to make utility, process, and waste handling connections between the cells and the HLV tanks. The pipe trench is located under the floor of the REC airlock just in front of the B-Cell door. The pipe trench is 1.3 meters wide, 6.4 meters long, and varies in depth from approximately 1.8 meters on the north end to 1.6 meters on the south end. Process and waste handling piping runs between the pipe trench and the HLV tanks, LLV tanks, and B-Cell.

The pipe trench also was designed to collect water used for decontamination in the REC airlock. The pipe trench was equipped with a steam jet that enabled solutions collected in the trench to be transferred to LLV tank 102, but the jet ceased functioning in 1985. Since that time, collected water has been managed by monitoring the pipe trench level, and by curtailing use of water in the airlock if levels reach an administrative control level. Alternatively, a pump has been connected to tubing running into the pipe trench. The outlet for the pump is connected to a line that passes through a shield plug in the airlock into B-Cell.

The pipe trench can be accessed by removing five 60-centimeter-thick cover blocks using B-Cell's 9.1-metric-ton bridge crane. The pipe trench is used to make process connections for the radioactive liquids being handled by the cells and the vaults. Examples of the connections include transfer lines to and from the vaults, lines to the loadout station, and lines to B-Cell. Also, various utility connections (chemical addition lines, air lines, and steam lines) can be made in the pipe trench. Additional information on the overall piping system is given in Section 2.3.3.

2.3.1.6.1 Construction and Operational Detail

The pipe trench is lined with 0.32m stainless steel plate. The pipe trench contains approximately 7.6 meters of 12-millimeter pipe, approximately 210 meters of 2.5-centimter pipe, approximately 46 meters of 5.08-centimeter pipe, and approximately 29 meters of 7.6-centimeter pipe. In the mid 1970's, a triple encased inter-building transfer line (transfer piping with two outer pipe containments) was installed in the pipe trench to transfer spent fuel dissolved in nitric acid to the 325 Building and to return the processed solution to the 324 Building (refer to Chapter 3.0, Section 3.1.2.3).

2.3.1.6.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure will be those that isolate piping associated with the HLV tanks. Note: To determine if additional closure activities are required, the pipe trench liner will be inspected on removal of the piping and drip pans.

2.3.1.7 Other Radiochemical Engineering Cell Components

Two other components of the REC are closure concerns. These are the pass-through ports and the cubicles.

2.3.1.7.1 Pass-through Ports

Pass-through ports are holes in the hot cell walls (ranging from 10 to 38 centimeters in diameter) that are used to pass items into the hot cells. The smaller ports generally are equipped with 'split plugs', which have shielding on the bottom for half of one plug and on the top half for the other half of the plug. This allows hoses and cords to be placed through the wall into the hot cell. The larger ports generally are equipped with shielding doors and are used to pass objects, such as tools or equipment, into (and possibly out of) the cell. There are no closure components requiring closure associated with the pass-through ports.

2.3.1.7.2 Cell Cubicles

Cell cubicles are located in the walls of A-Cell and B-Cell. The cubicles consist of a 10-centimeter-thick steel shielding door that opens into a small area in the wall. The cubicles do not penetrate the cell walls. The cubicle areas are used for making process connections (e.g., for steam, air, water, chemical addition) into the cells.

Eight cubicles are associated with A-Cell and B-Cell. Cubicles A-11 and A-12 are located on the first floor of the A-Cell gallery. Cubicles A-21 and A-22 are located on the second floor. Cubicles A-31 and A-32 are located on the third floor. Cubicles B-12 and B-14 are located on the first floor B-Cell gallery, west wall (Figure 2-7). As discussed in Section 2.3.3, the only components associated with the eight cubicles requiring closure are those associated with the isolation of the HLV tanks piping.

2.3.2 Description of High-Level Vault and Low-Level Vault

Two shielded underground vaults (HLV and LLV) are in the 324 Building (Figures 2-1, 2-6, and 2-9). These vaults are equipped with tanks for temporary storage of liquids. Each vault contains four stainless steel tanks. These tanks have been used as temporary holding tanks for feed solutions, feedstock tanks for process solutions, or collection tanks for effluents from project activities. The HLV and LLV tanks have been used to store mixed waste solutions.

2.3.2.1 High-Level Vault and High-Level Vault Tanks Description

The HLV is a rectangular concrete vault set under the floor of the cask handling area. The HLV is 6.4 meters long, 4.0 meters wide, and 4.4 meters deep, and is oriented in an east/west direction. The west end of the vault (the end closest to the REC cells) has a ledge approximately 1.4 meters high that enlarges the upper level of the HLV to 8.2 meters long.

The HLV contains four stainless steel tanks (104, 105, 106, and 107) (Figures 2-1, 2-6, 2-9, 2-10, 2-11, and 2-12). Tank 104 and Tank 105 are on the lower level, with Tank 104 being the eastern-most tank. Tanks 106 and 107 sit on the ledge, with Tank 107 being the northern-most tank. The smallest tank has a capacity of approximately 1,700 liters and the largest tank has a capacity of approximately 19,000 liters.

Each tank is a cylinder with a flat top and sloped bottom (except for Tank 107, which has a concave bottom) and a stainless-steel cooling jacket, although the cooling system has been deactivated. The HLV tanks are fitted with bubbler tubes with differential pressure transducers for measuring liquid level, specific gravity, and static pressure and with thermocouples for measuring temperature. Instrument readings are logged each normal working day. The tanks also are equipped with high-liquid level and high-temperature alarms, except Tank 106, which does not have an operational high-liquid level alarm. Because the stainless-steel cooling jackets are not being used, air now fills the space between each tank and its jacket. The head space in each tank is operated at slightly negative pressure, is vented through a common ventilation system that pulls air and tank vapors through two banks of HEPA filters located in Room 11, and is discharged to the main 324 Building stack.

When the HLV tanks were installed in 1964, the following design features were included to provide protection against releases of waste to the environment: corrosion-resistant stainless steel tanks and piping; welded pipe connections; tanks with top-entering penetrations only; secondary containment around tanks and piping; and instruments to control the fill level of the tanks and to detect leaks.

2.3.2.1.1 Construction and Operational Detail

The HLV is constructed of concrete and is lined with a welded 0.32-centimeter stainless steel plate over the floor, ledge, and partially up the wall. The plate, which provides secondary containment, covers the floor and extends 1.1 meters up the walls. The stainless steel plate also covers the floor of the ledge and extends 15.2 centimeters up the walls above the ledge. The floor is sloped in the shortest direction toward a trench located along the north wall. The trench, in turn, slopes from both ends of the HLV toward the middle where a 0.6-meter x 0.6-meter x 0.6-meter sump is located. The sump is equipped with a liquid sensing alarm and a steam jet to transfer liquids to Tank 104. The alarm set-point is maintained between 2.5 and 5.1 centimeters of liquid. The liquid-level instrumentation records levels down to zero. (Waste generation and management activities are addressed in more detail in Chapters 3.0 and 4.0.)

The HLV is covered by concrete 1.8 meters thick. The concrete shields against radiation to minimize exposure to personnel outside of the HLV. The HLV can be accessed from above by removal of the cover blocks, which cover about 40 percent of the vault floor area. Beneath the concrete cover blocks are removable steel plate ventilation barriers.

There has been no integrity assessment performed for the purpose of complying with WAC 173-303. The presence of high-activity radioactive material made the physical performance of an acceptable assessment unreasonably difficult. However, all of the available data required to assess the integrity of the unit have been evaluated and addressed in this closure document. Design standards, dangerous characteristics of material handled in tanks and cells, the age and history of the tanks in the vaults, and the results of construction testing of the tanks and piping are addressed.

Secondary containment is provided for all tank systems. The tank systems are housed in concrete vaults lined with seal welded 0.32-centimeter stainless steel plate. Capacities of the lined sections of the vaults are greater than that of the largest tank. The vaults are situated below grade and surrounded by packed native soil, providing a solid foundation. The vault floors are sloped toward a sump provided with leak detection, liquid-level indication instrumentation, and steam jets for removing accumulated liquid. The vaults are housed completely within the confines of the 324 Building so the vaults are protected from run-on and precipitation. The tanks, vaults, and cells are all ventilated to prevent the accumulation of hydrogen produced from the exposure of aqueous liquids to high-level ionizing radiation. Inaccessible ancillary piping is designed with jacketing where piping is imbedded in concrete or secondary containment. Accessible ancillary piping is subject to daily inspection.

Liquid transfers are accomplished using leak proof steam jets, vacuum transfer, or gravity flow. Transfer stations are supplied with metering equipment and tank volume indicators to prevent overflow. Tanks also are equipped with high-liquid level and high-temperature alarms, except Tank 106. Tank 106 had a high liquid alarm; however, it has failed and has not been repaired because of the high radiation field preventing access. Tank and secondary containment alarms annunciate both visibly and audibly in Room 310 (process control room) and the lobby. In addition, an audible alarm sounds in all galleries and the power operator's office to alert personnel if any monitored alarm point is exceeded.

Operating procedures requiring the inspection and documentation of tank systems and monitoring instrumentation have existed and evolved since the facility was opened. Currently, operator rounds are performed daily. The operator records instrument readings, inspects equipment for proper function and alignment, and notifies supervision to initiate corrective action in the event of equipment failure or out-of-specification instrument reading. Operators also are directed to look for abnormal conditions (e.g., leaks, fire hazards, plugged drains) and to initiate the appropriate corrective actions.

Alarms and instrumentation are maintained through a periodic preventative maintenance recall system in addition to corrective actions initiated during operator rounds and operations. Vault liquid alarms and instrumentation are designed to function through monitoring pressure differences caused by increases in the liquid level in the sump or vessel. Differential pressure transmitters located in the second floor gallery area routinely are serviced to ensure transmitters are in working order.

Tanks 105 and 106 were constructed in the early 1940's for a 200 Areas facility that was never constructed. In 1950, these tanks were transferred to the 300 Area and installed in the 321 Building. Tank 104 was constructed in 1954 and installed in the 321 Building as well. These tanks were removed from the 321 Building in 1958. From 1950 through 1958, the 321 Building was used for testing Plutonium and Uranium Extraction (PUREX) flow sheet modifications. Modifications of the tanks for use in the 324 Building vaults consisted of removing and patching bottom drains and side penetrations, adding penetrations in the lids for additional piping and instrumentation, and modifying the tank support legs to conform to the pitch of vault floors. The tank support legs are constructed of type 304-L stainless steel, welded in place. Tank 107 was built specifically for the 324 Building. The weld specifications for the tanks are Hanford Standard Specification HWS-4924-S. The radiograph specification is HWS-8227. The radiography and welding specification numbers and references to leak tests were obtained from notes on the as-built drawings. Although test results are unavailable, nonconformance to these standards typically would be noted on the as-built drawings. These drawings were approved by the cognizant engineer at the time of installation. Subsequent to testing, the tanks were accepted and placed into operation.

The four HLV tanks are interconnected with piping. These tanks are also connected to various other locations in the REC cells, as shown in Table 2-2. Specific design details and ancillary equipment are described in the following sections.

The HLV tanks have been rinsed, along with their associated piping as described in Chapter 3.0, Section 3.3.9. Dose rates in the HLV have been estimated at 60 R/hr due to residue in the tanks. In 1996, the HLV and LLV tanks were emptied and the HLV tanks were flushed to satisfy Tri-Party Agreement milestone M-89-01.

2.3.2.1.1.1 Tank 104

Tank 104 was built in 1954 and was originally installed in the 321 Building. Tank 104 is 2.7 meters in diameter by 2.7 meters high, has a capacity of 15,000 liters, and is constructed of 1.27-centimeter-thick Type 304-L stainless steel. The outer cooling water jacket is of 0.48-centimeter Type 304-L stainless steel. Tank 104 rests on 18 304-L stainless steel legs arranged in two concentric circles. In 1964, the tank was modified for use in the HLV and moved to its present location. As part of the modification, all of the circumferential and long-seam welds were radiographed to ensure the integrity of the tank. Additionally, the tank was leak tested by filling the tank with water, and the cooling jacket hydrostatically was tested to 138 kilopascals gauge.

2.3.2.1.1.2 Tank 105

Tank 105 was built in 1943, and was installed in the 321 Building around 1950. Tank 105 is 2.9 meters in diameter and 2.7 meters high, and has a design capacity of 19,000 liters. The tank is constructed of 1.27-centimeter-thick type 309 (25Cr-12Ni) Columbium austenitic stabilized stainless steel. The tank also has a 0.48-centimeter-thick outer jacket constructed of Type 18-8 Columbium austenitic stainless steel. Tank 105 rests on 18 304-L stainless steel legs arranged in two concentric circles. In a manner similar to Tank 104, Tank 105 was modified for use in the HLV and moved to its present location in 1964. At that time, all of the circumferential-stall and long-seam welds were radiographed; the tank was leak tested by filling the tank with water; and the cooling jacket hydrostatically was tested at 137.9 kilopascals gauge.

2.3.2.1.1.3 Tank 106

Tank 106, constructed in 1944, is 1.2 meters in diameter (including the cooling jacket) by 1.5 meters high and has a capacity of 1,700 liters. Tank 106 rests on the ledge beside Tank 107 and is supported by three type 304-L stainless steel legs. The tank walls and bottom are made of 0.64-centimeter type 309 (25-12) Columbium austentic stabilized stainless steel plate; the cooling jacket is made of 0.48-centimeter type 18-8 Columbium austenitic stabilized stainless steel; and the roof is made of 0.95-centimeter type 25-12 Columbium austenitic stabilized stainless steel.

2.3.2.1.1.4 Tank 107

Tank 107 is made of 0.64-centimeter-thick type 304-L stainless steel and was subjected to radiography and dye-penetration testing of the welds when built in 1963. This tank also has a 0.48-centimeter-thick outer jacket of type 304-L stainless steel. Tank 107 is supported by three Type 304-L stainless steel legs and rests on the ledge beside Tank 106. Tank 107 is 1.7 meters in diameter (including the cooling jacket) by 1.8 meters high and has a capacity of 3,600 liters. The tank cooling jacket extends 1.1 meters above the base of the tank. Tank 107 also has an agitator installed through a flange on the top of the tank.

2.3.2.1.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure are the four HLV tanks, the associated piping, the vault liner and potentially the surrounding concrete (in the event of liner breach).

2.3.2.2 Low-Level Vault and Low-Level Vault Tanks Description

The LLV is a rectangular concrete vault set under the floor of Room 147. Room 147 is used for repair of radioactively contaminated equipment. The vault is 8.7 meters long, 4.0 meters wide, and 5.6 meters deep, and is oriented in a north/south direction. The vault is lined with 0.32-centimeter stainless steel plate over the floor and 1.2 meters up the wall. The floor is sloped from both ends to the middle and to the west and has a sump in the middle of the vault along the west wall. The trench slopes from both ends toward the 0.6-meter by 0.6-meter by 0.3-meter sump. The sump is equipped with liquid sensing alarms and a steam jet siphon that discharges liquids to tank 102. The alarm setpoint is set at 2.5 to 5.1 centimeters of liquid.

The vault is covered by cover blocks (0.6-meter thick concrete) that reveal approximately 40 percent of the vault when removed from above. Beneath the cover blocks are removable steel plate ventilation barriers. The LLV is connected via a short tunnel to the HLV near the top of the vaults in the southern interconnecting wall. The vaults share the same air space, which is vented to the low pressure side of the A-frame air filter bank from the HLV.

The LLV contains four stainless steel tanks (Tanks 101, 102, 103, and 108) (Figures 2-1, 2-6, 2-9, and 2-13). All tanks are stainless steel with cooling jackets to enable circumferential heating and cooling of the tanks. The tank tops are flat and the tank bottoms are sloped. Tanks are vented through two HEPA filters located in Room 11 then flow into the main building exhaust.

The tanks rest on 18 pads placed in two concentric circles about the longitudinal axis of the tank and one in the center.

2.3.2.2.1 Construction and Operational Detail

The four tanks in the LLV were built in 1943, and subsequently were modified in 1963 for use in the LLV. All of the circumferential-stall and long-seam welds were radiographed following modification. Additionally, the tanks were leak tested by filling with water after the modifications were completed. As are the HLV tanks, the LLV tanks are fitted with bubbler tubes with differential pressure transducers for measuring liquid level, specific gravity, and static pressure and with thermocouples for measuring temperature. Instrument readings are logged each normal working day. Tank 102 is equipped with a liquid level alarm; no liquid level alarms are installed on the other tanks.

Tanks 101, 102, 103, and 108 were constructed in the early 1940s for use in a facility in the 200 Area that was never constructed. In 1950, the tanks were transferred to the 300 Area and installed in the 321 Building. These tanks were removed from the 321 Building in 1958. From 1950 through 1958, the 321 Building was used for testing PUREX flow sheet modifications.

Modifications of the tanks for use in the 324 Building vaults consisted of removing and patching bottom drains and side penetrations, adding penetrations in the lids for additional piping and instrumentation, and modifying the tank support legs to conform to the pitch of the vault floors. The tank support legs are composed of type 304-L stainless steel, welded in place.

The weld specifications for the tanks are Hanford Standard Specification HWS-4924-S. The radiography specification is HWS-8227. The radiography and welding specification numbers and references to leak tests are listed as notes on as-built drawings. Although test results are unavailable, nonconformance to these standards typically would be noted on as-built drawings. These drawings were approved by the cognizant engineer at the time of installation.

Construction and operational details associated with LLV secondary containment, construction specifications, integrity assessments, liquid transfers, alarms and instrumentation, and routine inspection and maintenance procedures are the same as those described for the HLV in Section 2.3.2.1.1.

The tanks are interconnected. The tanks also are connected to other locations in the REC cells as shown in Table 2.3.

2.3.2.2.1.1 Tank 101

Tank 101 is 2.0 meters in diameter (including cooling jacket) by 4.3 meters high and has a capacity of 12,500 liters. Tank 101 is constructed of 1.3-centimeters-thick Type 309 (25-12) austentic Columbium stainless steel. The outer cooling water jacket is of 0.32-centimeter Type 18-8 austentic Columbium stainless steel.

2.3.2.2.1.2 Tank 102

Tank 102 is 2.4 meters in diameter (including cooling jacket) by 4.3 meters high and has a capacity of 18,500 liters. Tank 102 is constructed of 1.27 centimeters thick Type 309 (25-12) austentic Columbium stainless steel. The outer cooling water jacket is of 0.32 centimeter Type 18-8 austentic Columbium stainless steel.

2.3.2.2.1.3 Tank 103

Tank 103 measures 2.0 meters in diameter (including cooling jacket) by 4.3 meters high and has a capacity of 12,500 liters. Tank 103 is constructed of 1.3-centimeters-thick Type 309 (25-12) austentic Columbium stainless steel. The outer cooling water jacket is of 0.32 centimeter Type 18-8 austentic Columbium stainless steel.

2.3.2.2.1.4 Tank 108

Tank 108 is 2.0 meters in diameter (including cooling jacket) by 4.3 meters high and has a capacity of 12,000 liters. Tank 108 is constructed of 1.3-centimeter-thick Type 309 (25-12) austentic Columbium stainless steel. The outer cooling water jacket is of 0.32 centimeter Type 18-8 austentic Columbium stainless steel.

2.3.2.2.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure are the four tanks, the associated piping, the vault liner and potentially the surrounding concrete following final removal of equipment supporting the D-Cell liquid waste treatment system.

2.3.2.3 Sample Room (Room 145) Description

The sample room (Room 145) contains shielded sampling equipment for the HLV and LLV tanks. The sample room is a 2.7-meters x 1.8-meters x 2.6-meters metal enclosure with a concrete-shielded roof located on the first floor in the northwest corner of the EDL-146.

2.3.2.3.1 Construction and Operational Detail

Inside the sample room is a shielded stainless-steel sample collection and loadout box that has vacuum sampling lines to the HLV tanks. The sample collection box has viewing ports and covers. A separate Plexiglas sample collection and loadout box for the LLV tanks is located at floor level in the corner of the room. Samples of all the tanks were taken in 1990. The HLV sample system was not used routinely because of high dose rates associated with loadout of the samples. Although the sample collection and loadout boxes are well maintained, the boxes are internally contaminated.

2.3.2.3.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure are the isolation of piping associated with the HLV/LLV tanks.

2.3.3 Description of the Piping System

The piping system within the 324 Building serves a variety of functions, with separate lines for liquid transfers, tank sampling, tank venting, and sparging. The piping system also includes chemical addition lines, raw (cooling) water supply lines, raw water return to the retention process sewer, instrument air lines, compressed air lines and steam lines.

2.3.3.1 General Characteristics of the Piping System.

The piping associated with the REC and the two vaults varies from 0.64 centimeters to 7.6 centimeters in diameter and is made of stainless steel with welded joints. At the time of installation in 1964/1965, all building piping was pressure tested at 21 kilopascals and at 1,720 kilopascals (water and steam), respectively, and did not experience pressure loss in a 24-hour period.

Liquids are moved using jets (siphon pumps). Unlike mechanical pumps, jets essentially are maintenance free. The jets function by creating a suction that draws the liquid to the desired location. The steam jets can be used to move liquids between the vaults and the REC, between cells, between tanks in the vaults, and between the vaults. Air jets are used to collect samples from the vault tanks.

Gravity also is used for moving the liquids. The piping that enters the vaults flows to the vault tanks by gravity flow. The gravity piping system was designed with a fall of 0.52 centimeter per meter of run. This slope yields a flow capacity of 30 liters per minute for the 3.8-centimeter diameter pipe and 60 liters per minute for the 5.1-centimeter diameter pipe. Instrumentation piping, vent piping, sparging piping, and sampling piping have a continuous upward slope from the vault tanks to eliminate the potential for siphoning in these piping systems.

Within the two vaults, the piping was constructed over the stainless steel lining and above the tanks. The vault serves as secondary containment in the event a pipe leak should develop. All piping originally associated with the HLV system is embedded at 0.6 meters inside the concrete floor or walls. Piping added to HLV Tank 106 in 1977 to support the inter-building pipeline for transfer of dissolved spent fuel is sleeved inside a 30.5-centimeter diameter stainless steel pipe. Outside of the vaults, there is no specific secondary containment for most of the piping system other than the structural concrete of the floor and walls. Exposed concrete is painted in most cases but impermeability cannot be assured.

Piping from the HLV is routed to the pipe trench in the REC airlock. Piping is routed from the pipe trench through the structural concrete to various locations in the REC Cells, such as through shield plugs to B-Cell, cubicles servicing A-Cell and B-Cell, piping manifolds on the east and west walls of C-Cell and D-Cell, various jet stations in the trucklock and cask handling area, and the loadout stall located in the trucklock. The piping system was designed to offer the greatest flexibility in transferring liquids, allowing liquids to be routed to any location within the REC complex depending on jumper configurations made in the pipe trench, loadout stall, or cell cubicles.

2.3.3.2 Construction and Operational Detail

Piping from the HLV and LLV tanks are of all-welded stainless steel construction. Pipe diameters range from nominal 7.6 centimeters down to 1.3 centimeters, with the majority of pipes being 2.5 centimeters. There are an estimated 1,676 linear meters of piping associated with the HLV and LLV systems. Approximately two-thirds of this (1,117 meters) is in the HLV system with the remainder (559 meters) in the LLV system. All pipes from the HLV are embedded in the concrete floor and are buried at least 0.6 meters into the REC cell floors. Piping typically is encased in a nominal 10-centimeters diameter fiberglass reinforced epoxy pipe where the piping passes through a concrete structure. For some of the HLV piping, a nominal 30.5-centimeter stainless steel pipe is used for secondary containment.

Some of the piping into the REC cells is routed into a duct space underneath the REC air lock floor and into the pipe trench in the REC air lock. Piping is routed from the pipe trench to various locations associated with the cells, either through shield plugs into the B-Cell basement, through shield walls to 'cubicles' in the gallery walls of A-Cell and B-Cell, to piping manifolds in C-Cell and D-Cell, to the jet station in the cask handling area, the tank level indicator station in the trucklock, or the loadout stall. Although this feature generally was unused, the piping system was designed to be flexible, allowing for liquids to be routed to any number of locations by making different jumper connections in the REC air lock pipe trench.

Accessible piping and equipment is inspected during daily surveillance rounds. Deficiencies are noted and corrective maintenance is initiated based on the observations from the surveillance rounds.

2.3.3.3 Closure Unit Components (Pipelines into the REC, HLV, and LLV)

Pipelines associated with dangerous and mixed waste transfer operations among the REC, the HLV, and the LLV are closure unit components (Table 2-1). Ancillary piping and equipment to the tanks that was used to distribute, meter, or control the flow of dangerous wastes per WAC 173-303-040 are included. The inter-building pipeline used for the transfer of dissolved spent fuel is outside the closure boundary and will be dispositioned as part of building D&D and TPA past practice processes.

2.3.4 Other 324 Building Areas within the Closure Unit Boundary

The following four other areas are of importance within the closure boundary: the cask handling area, the trucklock, EDL-146, and the operating galleries.

2.3.4.1 Cask Handling Area

The cask handling area is situated immediately north of the SMF cells and immediately east of the REC cells. All entries into either airlock are staged from the cask handling area.

The cask handling area provides access to the manipulator repair shop (Room 147), the vault sample room (Room 145), and the EDL-146. Cover blocks providing access to Zone 1 ventilation A-Frame HEPA filters are in the southwestern portion of the area. The cover blocks to the HLV are located approximately on the north/south centerline on the north end of the room, directly in front of the REC airlock door. An abandoned wet cask transfer basin is in the floor just south of the HLV. This basin has been filled with sand and has a concrete cap.

The east wall of the REC airlock borders the cask handling area. The window, the remote mechanical manipulators, and door are accessible in the cask handling area. The airlock wall has a shielded window and manipulators for the REC airlock and the shielded door to the airlock. The west wall of the cask handling also has three cable reel housings (one for the B-Cell/airlock crane, one for the D-Cell crane, and one for the C-Cell crane; and a short balcony that extends out from the D-Cell operating gallery (used as an observation platform and a staging area for moving equipment to and from the D-Cell operating gallery). There are also various instruments and controls in the wall. The east wall of the cask handling area gives access to Room 147, Room 145, and EDL-146. Room 147 and EDL-146 both have large roll-up doors as well as personnel doors. Mounted near the ceiling is piping for various services. The north wall has large foldout doors to the trucklock, wide rollup door near the ceiling for crane access, and a personnel door just to the west of the foldout doors. The south wall has wide doors to the SMF airlock access area, and a hand-winched door to allow cask handling area crane access to the SMF airlock foyer area.

2.3.4.1.1 Construction and Operational Detail

The cask handling area (Figure 2-3) is 10.4 meters x 20.1 meters x 10.7 meters high. The floor of the cask handling area is concrete. The HLV is located under the floor of the cask handling area. The cask handling area provides access into the airlock via a steel shield door. An overhead bridge crane (27.2-metric-ton capacity main hoist and 4.5-metric-ton capacity auxiliary hoist) spans the east-west dimension of the cask handling area. This crane also services the trucklock allowing heavy loads to be moved from the trucklock to the SMF air lock or the REC airlock entrances.

Services contained in the cask handling area include: compressed air; vacuum; vacuum air sampling; compressed gas (argon); process water; emergency shower water; high pressure steam; breathing air; instrument air; acid; fire detection/suppression; telecommunications; heating, ventilation, and air conditioning; alarms and monitors; and electrical service/equipment. Steam, water, and compressed air are included in a 'jet station' in the north west corner of the room.

2.3.4.1.2 Closure Unit Component

There are no closure components within the cask handling area. However, the HLV resides immediately below the area and is considered a separate area. The HLV area is described in Section 2.3.2.1.

2.3.4.2 Trucklock

The trucklock (Figure 2-3) is located to the north of the cask handling area. The east side of the room is a stall where trucks are admitted into the building. This area is lower than the rest of the room by 1.5 meters, providing a loading dock area on the south and north sides of where a truck would be backed into the room. The southeast corner of the truck stall has a short flight of stairs and the stall has a sump. Sump contents can be transferred to tank 102 in the LLV using a jet siphon. The west side of the room contains the loadout stall for radioactive liquids from the bowling ball casks, discussed in the following paragraphs. The trucklock shares a bridge crane with the cask handling area discussed above.

On the south wall is a cabinet containing manometers that show tank levels in the HLV tanks and the LLV tanks and valves for the jet station in the southwest corner of the truckstall.

2.3.4.2.1 Construction and Operational Detail

The trucklock is 11 meters by 10.4 meters by 10.7 meters high. Trucks, trailers, and train cars that are 9.2 meters long or less can be accommodated. Outside access into the trucklock is via a 3.7-meter-wide by 3.1-meter-high vertically sliding door.

Located within the trucklock is a decontamination and cask loadout stall. The stall is a 2.1-meter-long, 1.5-meter-wide, and 3.1-meter-high steel and stainless enclosure. Large front and top doors provide access to the stall. The loadout stall is a shielded enclosure for loading and unloading radioactive liquids to and from the HLV tanks and the LLV tanks. Radioactive liquids often are transported in shielded tanks ('bowling ball casks'). The loadout stall has services to enable operators to decontaminate the 'bowling ball casks' before allowing the casks to be shipped out of the building.

The loadout stall is constructed out of steel and lead and has a stainless steel liner. The roof of the loadout stall is hinged and can be pulled up to lean against the west wall of the trucklock using a pulley and cable arrangement. There is also a wide access door on the north wall of the stall, with a shielded window in the door. The loadout stall has lead glass windows in the south, east, and north walls, and remote/mechanical manipulators on the south and east walls.

2.3.4.2.2 Closure Unit Component

There are no components within the trucklock that require closure (Table 2-1). The loadout stall was used to radiologically decontaminate exteriors of casks, this is not a TSD operation and therefore does not require closure.

2.3.4.3 Engineering Development Laboratory-146 (Room 146)

The EDL-146 (Figure 2-3) is a radiological contamination area located east and adjacent to the cask handling area. EDL-146 is used primarily for engineering development work with low levels of radioactivity. A partial mezzanine in the room divides the room into two floors. The mezzanine and parts of the first floor area are served with a bridge crane. Room 145, which is situated adjacent to the EDL-146, contains the vault tank sampling station.

EDL-146 contains energized laboratory equipment, along with various nonenergized equipment and supplies. There are several fume hoods on the southeast and north walls. There is a large walk-in hood that contains testing equipment (vitrifier). There are also several argon and nitrogen compressed gas cylinders. There are two transformers mounted on the north wall, numerous electrical panels located around the room, and an emergency safety shower and eye wash station. The mezzanine contains electrical equipment storage racks, an unused walk-in enclosure, and an electrical transformer.

2.3.4.3.1 Construction and Operational Details

EDL-146 is a large unshielded room 9.1 meters wide, 14.6 meters long, and 10.4 meters high. Service connections for various utilities (steam, air, and water), waste lines, and ventilation headers are located along two walls. Access is from the cask handling area via a 3.1-meter-wide by 4.3-meter-high roll-up door. There are also personnel access doors into the cask handling area and the SMF gallery.

2.3.4.3.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure are those involved with isolation of EDL-146 piping associated with the HLV and LLV tanks. No other known TSD activities are associated with the EDL. However, deactivation end points have been established for Room 146.

2.3.4.4 Operating Galleries

The basement, first floor, second floor, and third floor galleries (Figures 2-2 to 2-5) are the personnel access spaces around the REC. Operating stations for the remote equipment with viewing windows are located in the galleries for the REC. Various utility lines (steam, water, air, chemical addition) are available in the galleries for connecting to the REC. The galleries also provide access to A-Cell and B-Cell cubicles.

In the basement, galleries provide access to the south and west exterior of B-Cell. On the first floor, galleries provide access to the south exterior of C-Cell, the south, west, and north exteriors of B-Cell, and the north exterior of A-Cell. On the second floor, galleries provide access to the south exterior of D-Cell, the south, west, and north exterior of B-Cell, and the north exterior of A-Cell. On the third floor, galleries provide access to the south exterior of D-Cell and the north exterior of A-Cell.

The REC operating galleries consists of:

- Room 18
- Corridor 13
- Room 131
- B-Cell sample loadout
- Room 244
- Room 245
- Room 311
- Stairwells 7 and 8.

Rooms 131, 244, 245, and 311 form the operating galleries, while the other areas listed either are support or, in the case of the sample loadout, special purpose areas. Common to these areas are shielded observation windows, shield plugs and split plugs, remote/mechanical manipulators, periscopes, and testing equipment. Other features common between these areas are the panels for cell lighting, floor drains, ventilation supply, ventilation alarms (in case of airflow reversal), and high-level alarms. Common cell features that extend into the galleries are the cubicles.

Corridor 13 is the passageway between the step off pads at the change room and various areas in the contaminated portions of the 324 Building. Specifically, Corridor 13 leads to Room 131 (the first floor operating gallery and serves A-Cell, B-Cell, and C-Cell), the C-Cell operating gallery portion; stairwell number 7, the cask handling area, and the SMF operating access to the SMF airlock. The C-Cell portion of the room has a large observation window in the north wall, allowing a view of the C-Cell Operating Gallery.

The C-Cell portion of the room is partitioned off from the B-Cell and A-Cell areas with a double door. Operating controls for the C-Cell 2-ton crane are in this portion of the room.

The B-Cell and A-Cell portions of Room 131 are not separated. The A-Cell portion of Room 131 is fairly narrow and contains the door to stairwell number 8, which can be used to go to the upper REC cell galleries. On either side of the A-Cell window is a cubicle (A11 on the left and A12 on the right). These cubicles have service connections from the cell and from various HLV and LLV tanks, and to the pipe trench. Cubicles provide access to piping to easily reroute fluids through the REC tanks and systems. All cubicles are shielded with thick, shielded double doors.

The B-Cell portion of the room contains portable equipment used for in-cell work: plasma torch support equipment, medium pressure water wash equipment, the hydraulic unit for a hydraulic powered cutter, and controls for the B-Cell electrostatic precipitator. There are three shielded viewing windows at B-Cell work stations on the north, west, and south walls. Operating controls for the B-Cell cranes are also in this room. The west window has a cubicle on either side (B14 on the left and B12 on the right). Room 131 also contains the B-Cell sample room, which is a small room outside the northeast corner used to collect process samples during operation and to transport small equipment into the cell. The B-Cell sample room contains a transfer tray to transfer equipment between the room and B-Cell. The transfer mechanism has a Plexiglas hood in front to help with radiological contamination control.

Room 244 is the operating gallery for the upper floor of B-Cell and the second floor of A-Cell, and contains building service connections.

The A-Cell portion of Room 244 (northeast section) contains a shielded window with two manipulators and a cubicle on either side of the window (A21 on the left and A22 on the right). There is also a door into Stairway Number 8.

The B-Cell portion of Room 244 surrounds B-Cell on the north, west, and south. In the middle of the north wall of B-Cell is an air conditioning unit. The northwest corner of the room has an emergency exit into Corridor 20 and a cluster of steam lines. The west wall has two clusters of tank level transmitters and the southeast corner of the room has a jet control station and the door to Room 245.

Room 245 is the D-Cell operating gallery. The entrance from Room 244 is through double doors into a short corridor formed by an extension of the D-Cell floor into the operating gallery. The southern end of this short corridor has a door into Stairway Number 7 and directly across from here is a short stairway onto the working floor of the D-Cell gallery. Directly above the door into Room 244 is a grated platform, accessed by ladder from the working floor that allows access to various controls and instruments. Immediately at the top of the short stairway into the main part of the room is an instrument panel.

On the east wall of the room is a double door that opens on to a mezzanine overlooking the cask handling area.

Room 311 is the third floor operating gallery for A-Cell. This room does not have a viewing window, but does have two cubicles (A31 and A32). Also in this room are some electropolishing controls, the reel housing for the A-Cell crane cable reel, and some transformers and switchgear. The door at the east end of the room opens into the trucklock area for crane maintenance.

2.3.4.4.1 Construction and Operational Detail

These areas are considered buffer or support areas and were not designed as primary containment or to provide radiological shielding.

2.3.4.4.2 Closure Unit Components

As shown in Table 2.1, the components requiring closure are the piping associated with the HLV and LLV tanks. No other known TSD activities are associated with the galleries.

2.3.4.5 Room 18

Room 18 is an 'L' shaped room that borders the west and south sides of the B-Cell basement. Room 18 contains the shield plug openings into B-Cell. Room 18 also includes motor control center Number 6N, four monitoring stations for retention process sewer diverters, electrical equipment, asbestos-insulated piping (approximately 24 linear meters), ventilation systems, and blanked off floor drains. The floor, walls, and ceiling are all painted concrete. There is an open vent in the ceiling that connects Room 18 air space with that of Room 113. There also are two sealed access ports: one to the Zone II ventilation tunnel, and one to the ventilation crawl spaces under A-Cell, C-Cell, and the airlock. Ventilation and balance smoke lines (for HEPA leak/seal checks) for the A-Frame HEPA filters are also present in the northeastern corner of the room.

2.3.4.5.1 Construction and Operational Detail

Room 18 is considered a support area and was not designed as primary containment or to provide radiological shielding.

2.3.4.5.2 Closure Unit Components

As shown in Table 2-1, the components requiring closure are the piping associated with the HLV and LLV tanks and potentially the concrete surrounding the B-Cell shield plug openings.

2.4 SECURITY INFORMATION

The general security requirements in the 300 Area, as described, are current as of March 2005. Continued reduction in security measures is expected due to the reduction of 300 Area special nuclear material inventories.

All persons entering the 300 Area must display a RL-issued security identification badge indicating appropriate authorization. Personnel are subject to random searches of items carried into and out of the 300 Area. Signs posted at the 300 Area boundaries currently state:

> 'NO TRESPASSING. SECURITY BADGES REQUIRED BEYOND THIS POINT. PUBLIC ACCESS PROHIBITED'

or an equivalent legend.

The 324 Building is currently locked at all times, and access is limited to personnel with keys or proximity cards; badged visitors must contact their host from the door to gain entry. Proximity cards only can be obtained by trained personnel who have completed the Hanford General Employee Training program, the facility hazards communication training, and the facility orientation training. The access, when granted, is typically for normal operations hours only (i.e., 6:00 a.m. - 5:00 p.m.). Twenty-four hour access is granted only to those who have a need based on job responsibilities.

Inside the 324 Building, the lobby and first and second floor offices are the only nonradiologically controlled areas. Access to the REC, HLV, and other radiologically controlled areas is restricted. Entry codes are required for access. Entry into the REC airlock and hot-cells are administratively and physically controlled requiring use of multi-organizational authorization (i.e., operations supervision, radiological control, hot cell operations) and physically controlled by a double-key entry system. In addition, access to the HLV and LLV are physically controlled with cover blocks requiring the use of a crane for removal.

Currently, there is 24-hour surveillance of building areas and systems. Post-deactivation requirements will include removal of the key-card system and physical locks at the building entrance. The 324 Building entrance will be padlocked and other points of access sealed. Periodic surveillance will be planned and implemented pending final deactivation and decommissioning (refer to Chapter 8.0).

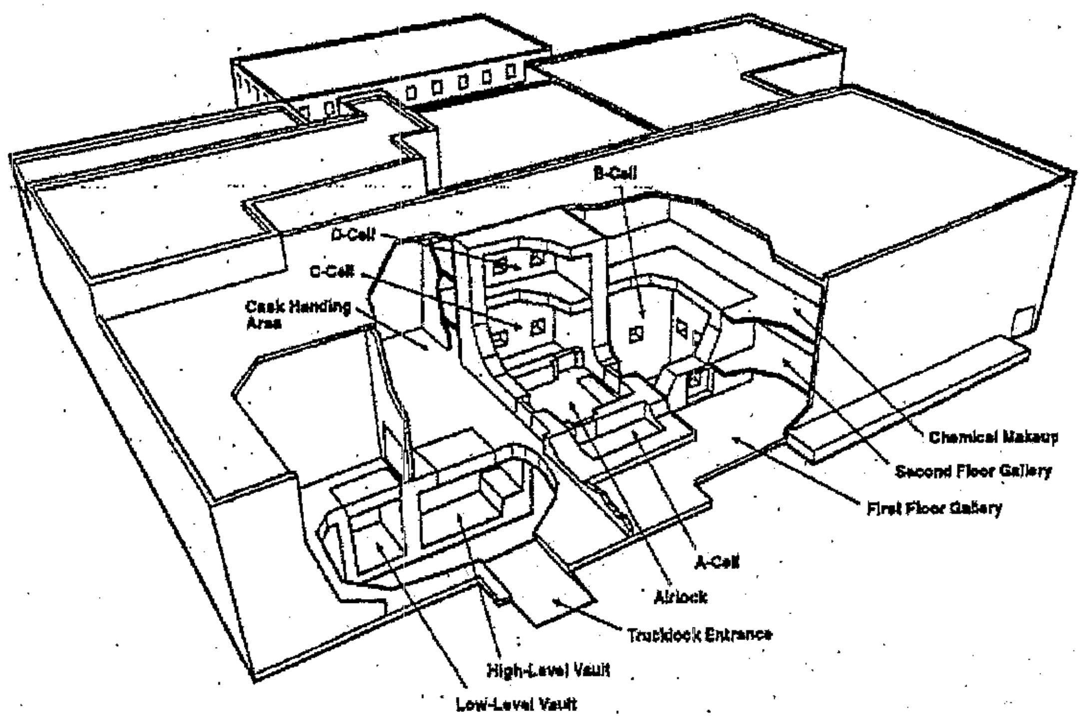


Figure 2-1. Cut-Away of the 324 Building showing the High-Level Vault, Low-Level Vault, and the Radiochemical Engineering Cells.

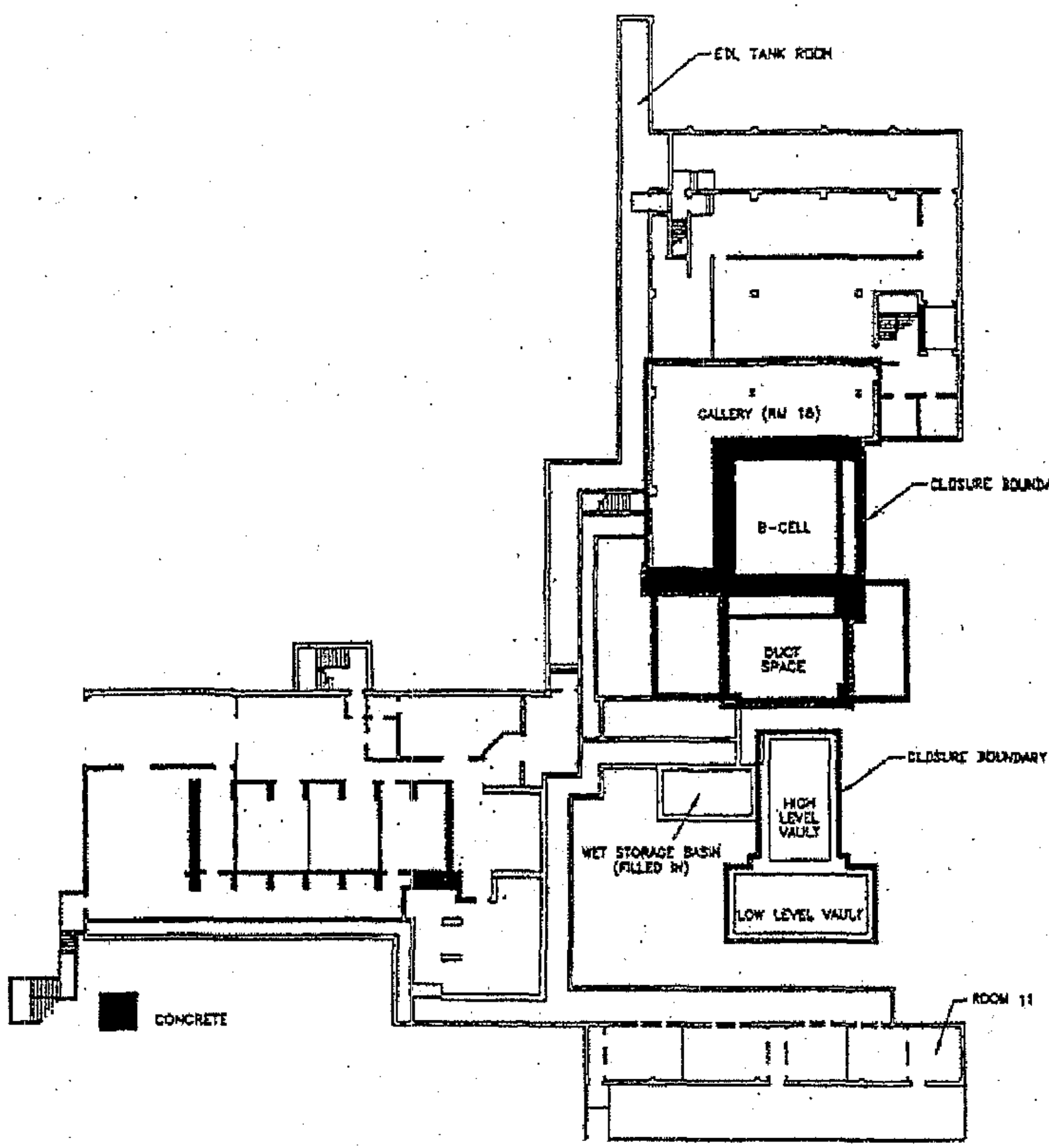


Figure 2-2. 324 Building Basement Plan.

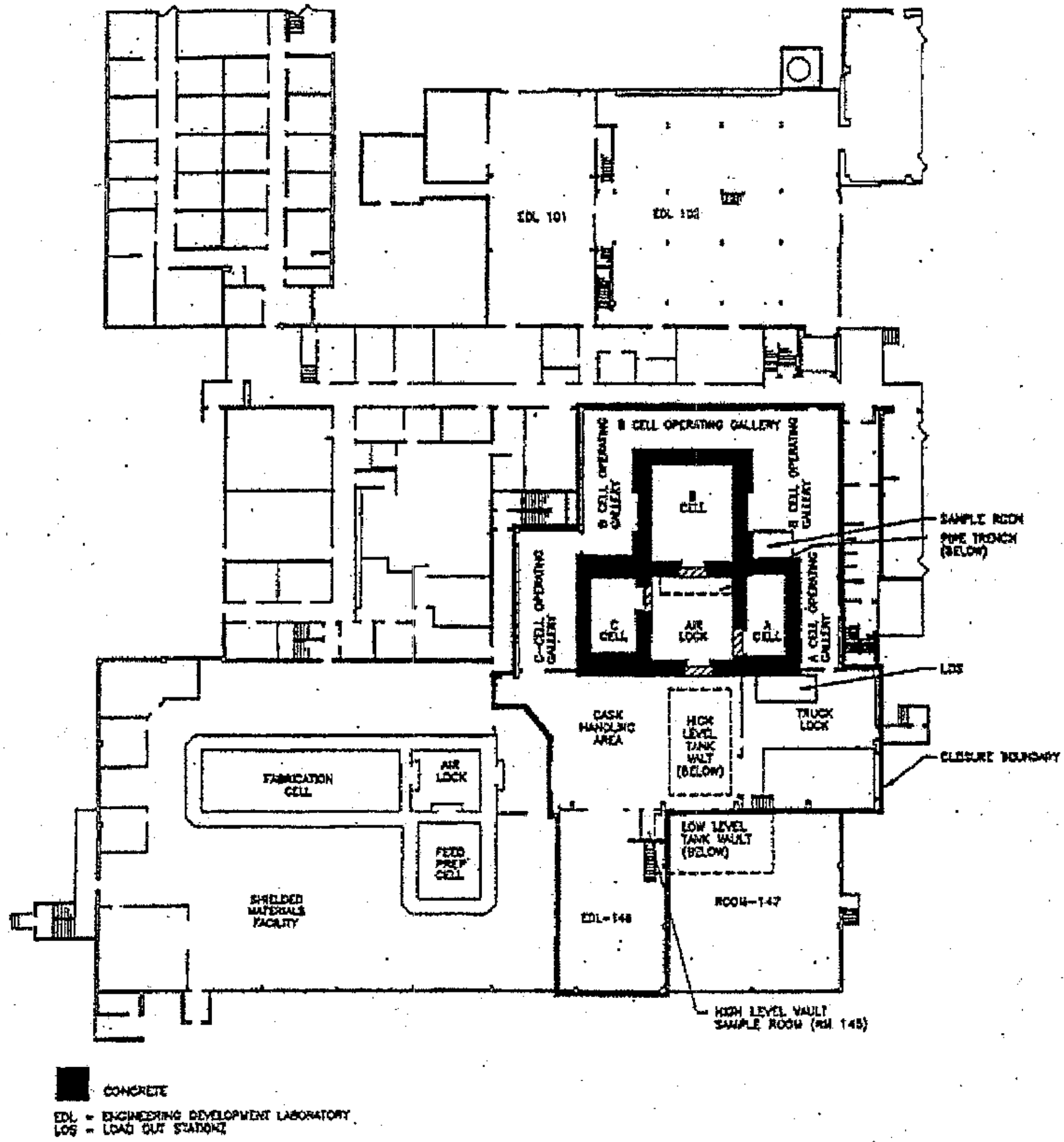


Figure 2-3. 324 Building First Floor Plan.

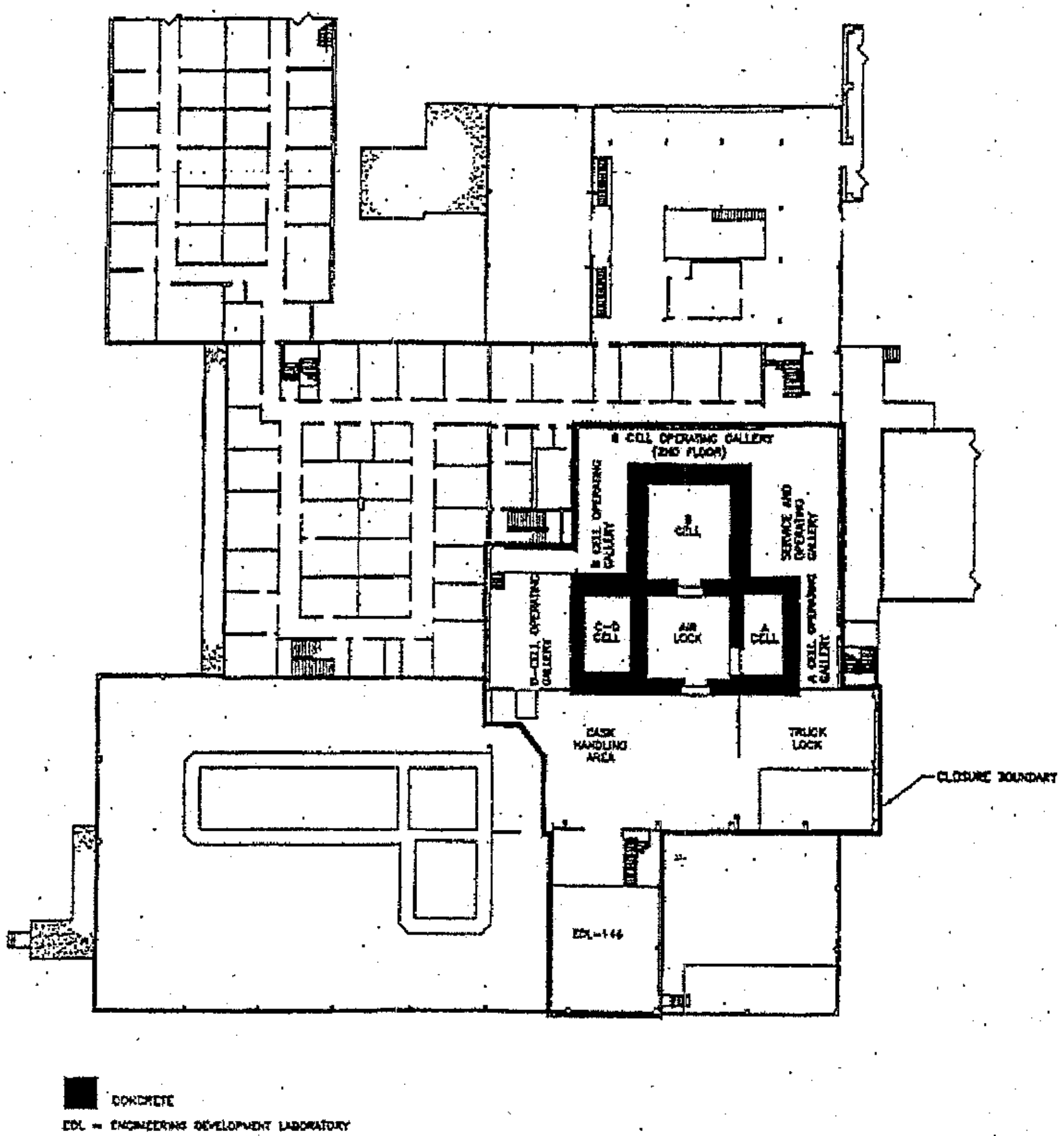


Figure 2-4. 324 Building Second Floor Plan.

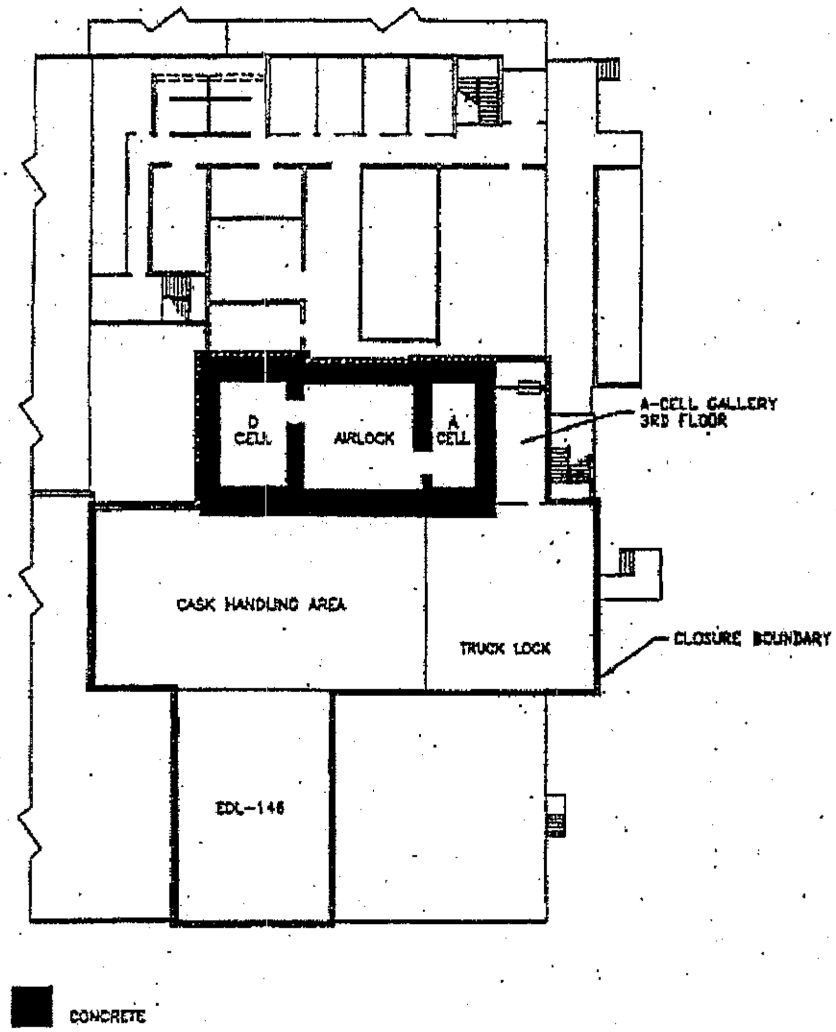


Figure 2-5. 324 Building Third Floor Plan.

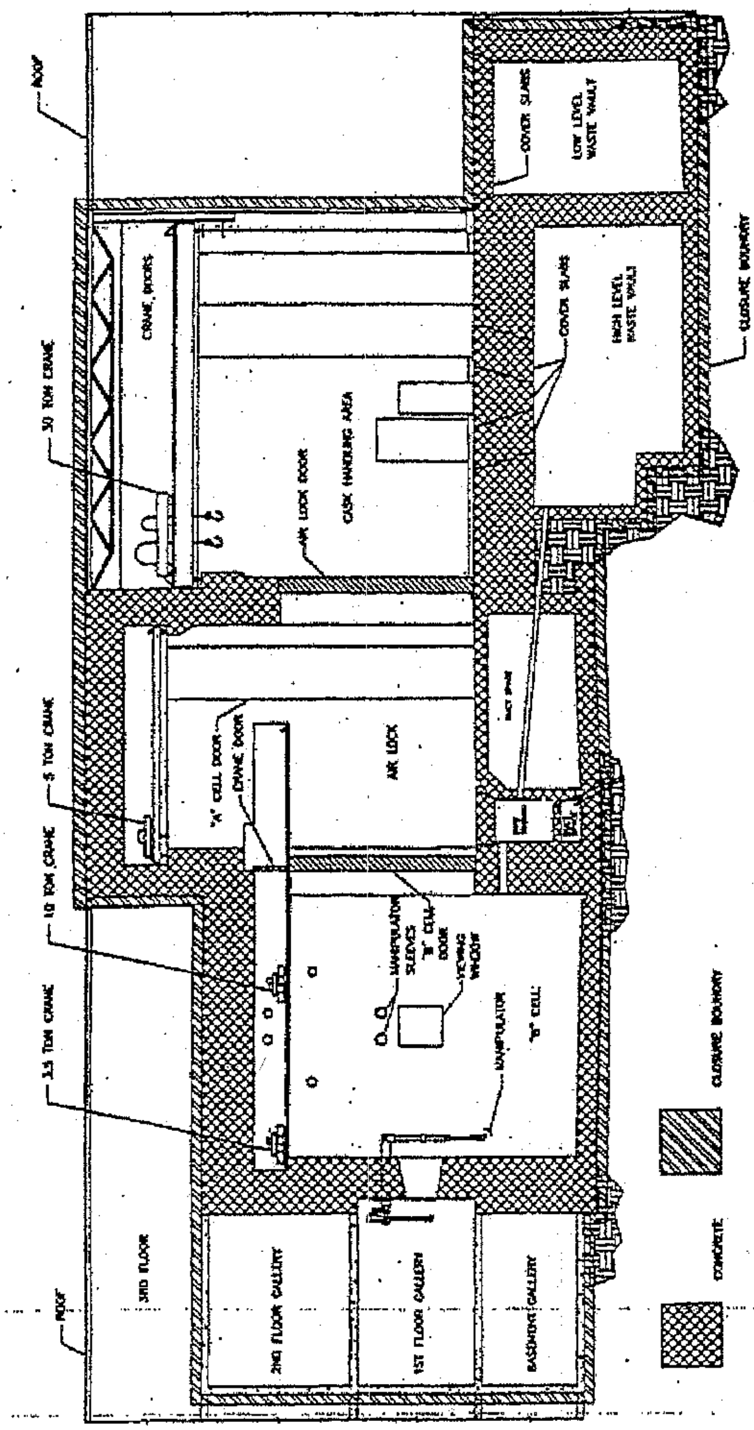


Figure 2-6. 324 Building Cross-Section Through the High-Level Vault, Low-Level Vault, Airlock, and B-Cell.

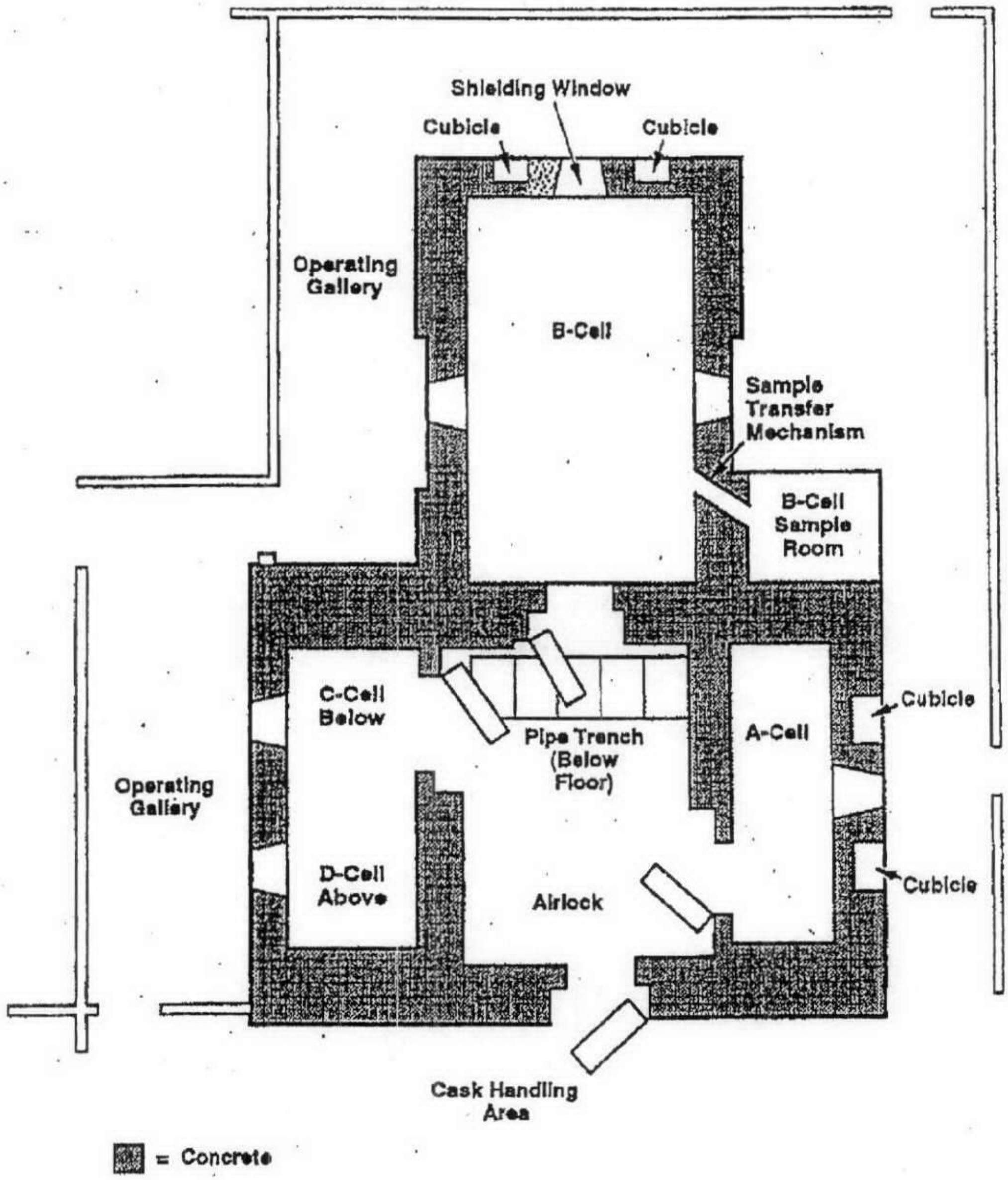


Figure 2-7. Overall Planning for 324 Building Radiochemical Engineering Cells.

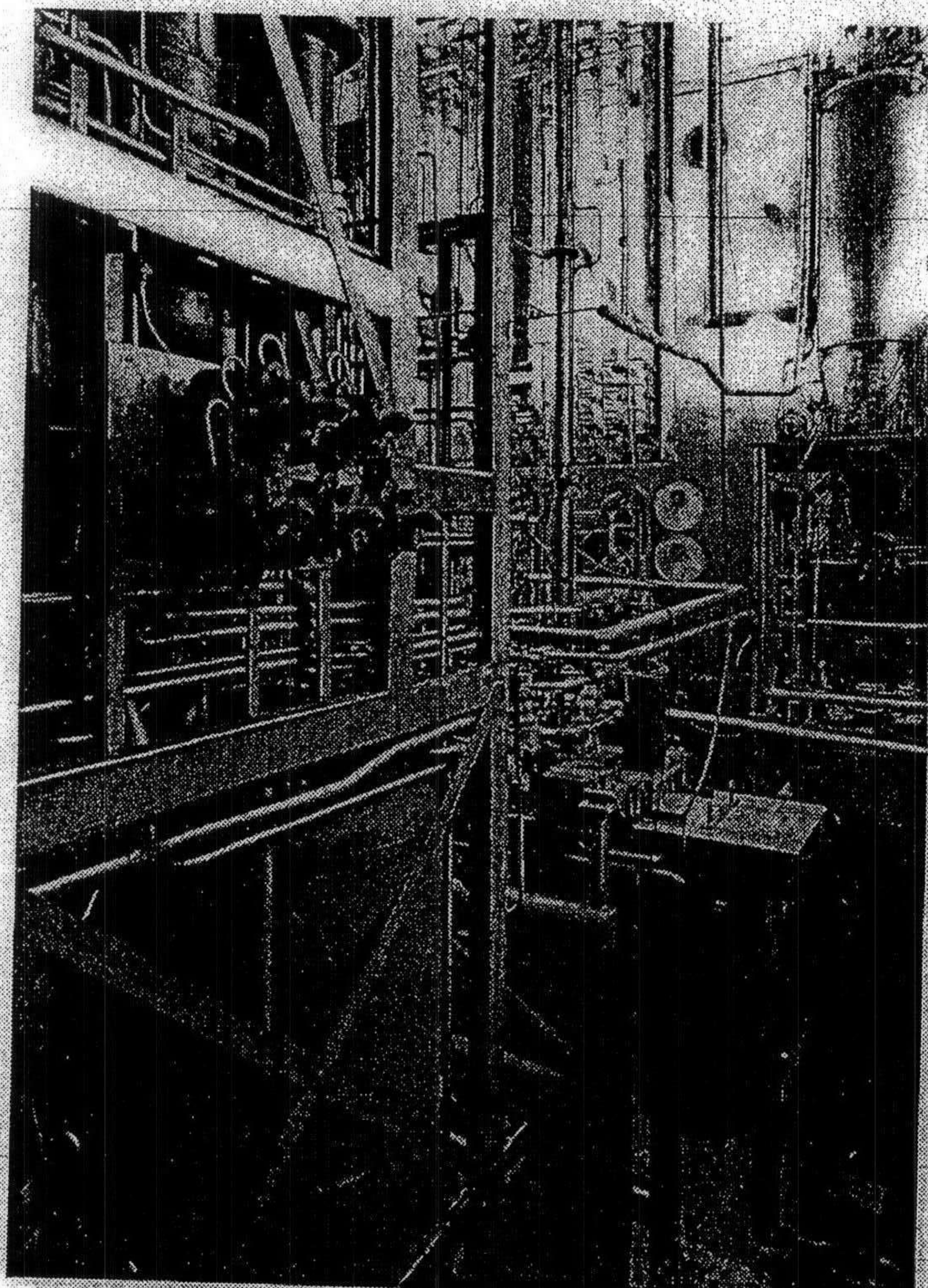


Figure 2-8. 324 Building REC B-Cell Photograph.

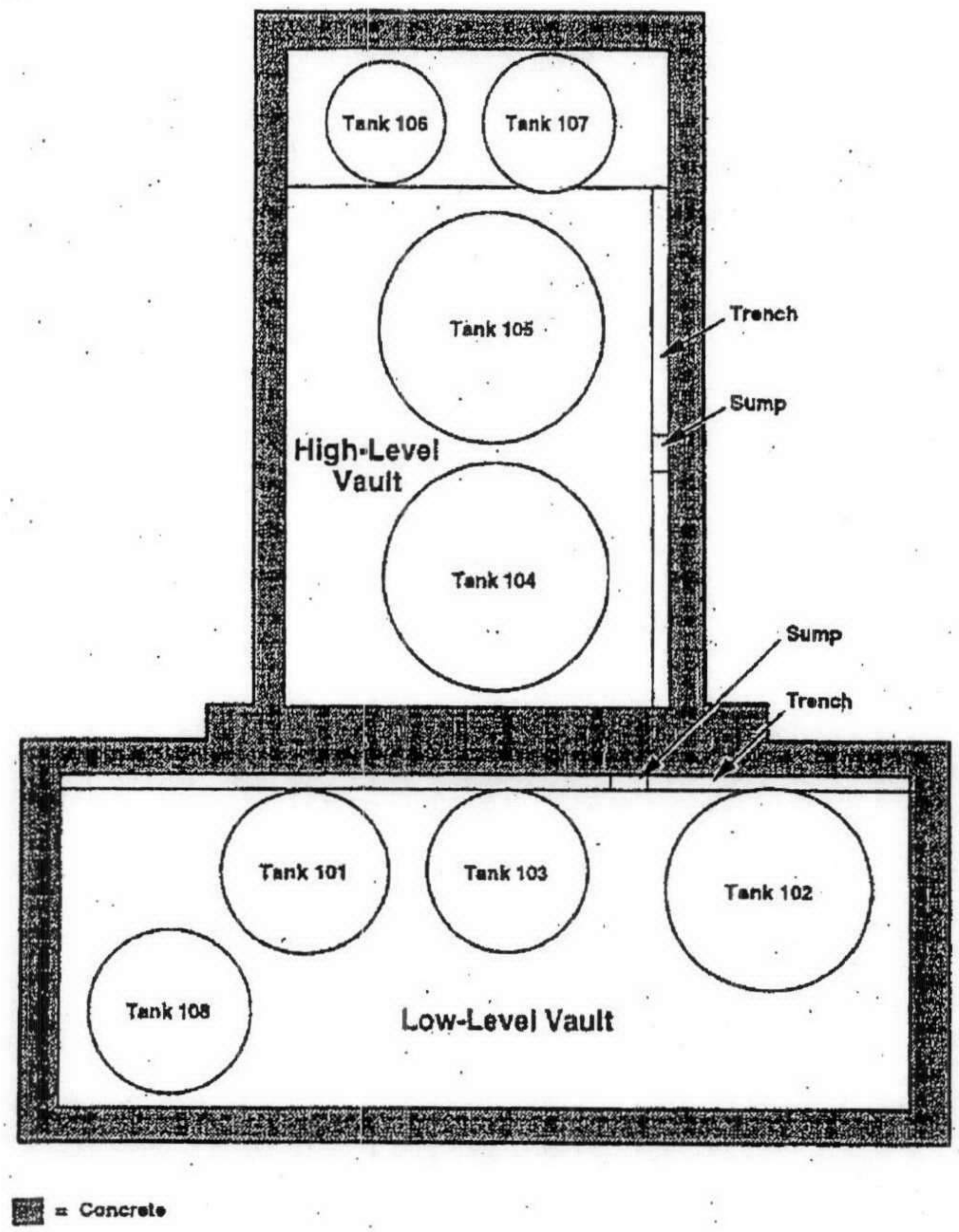


Figure 2-9. 324 Building High-Level Vault, Low-Level Vault, and Vault Tanks.

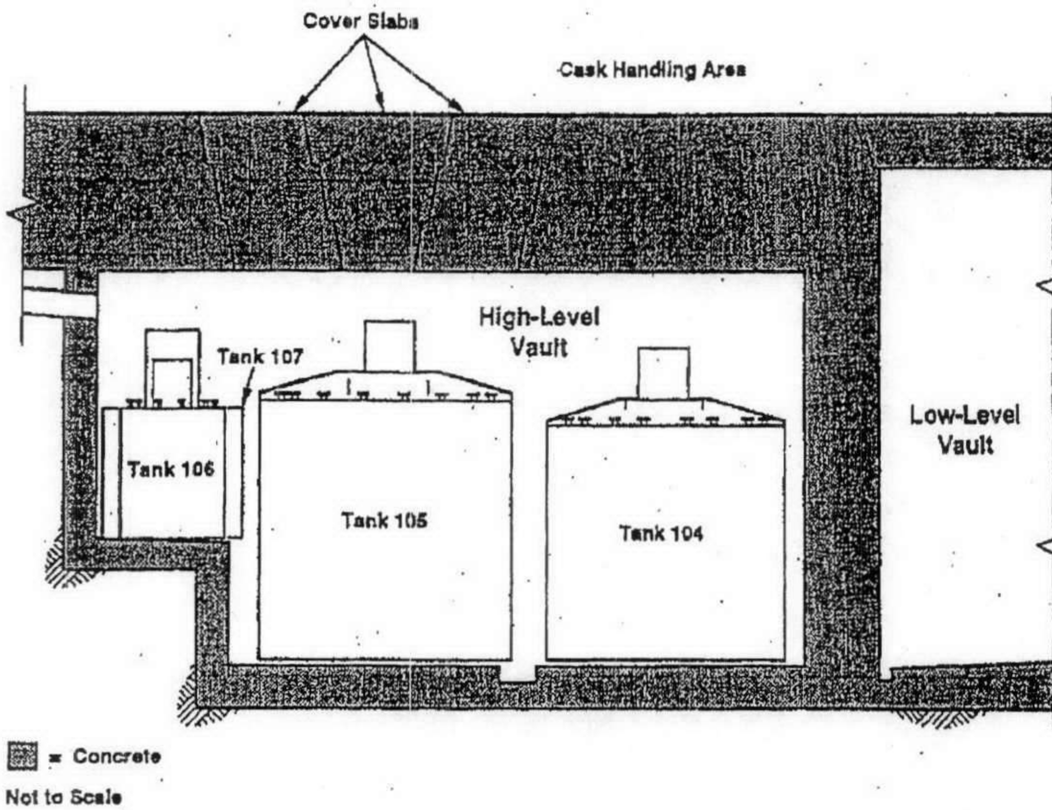


Figure 2-10. 324 Building High-Level Vault Cross-Section.

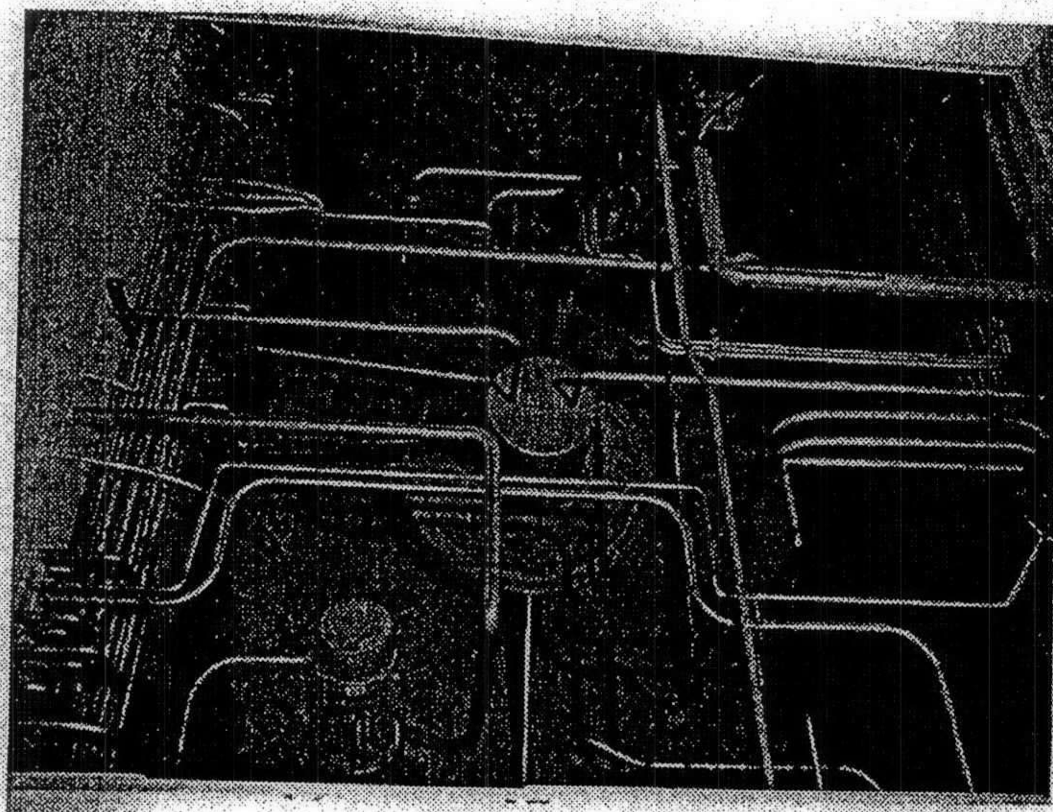


Figure 2-11. 324 Building HLV Construction Photograph.

Figure 2-12. 324 Building HLV Construction Photograph.

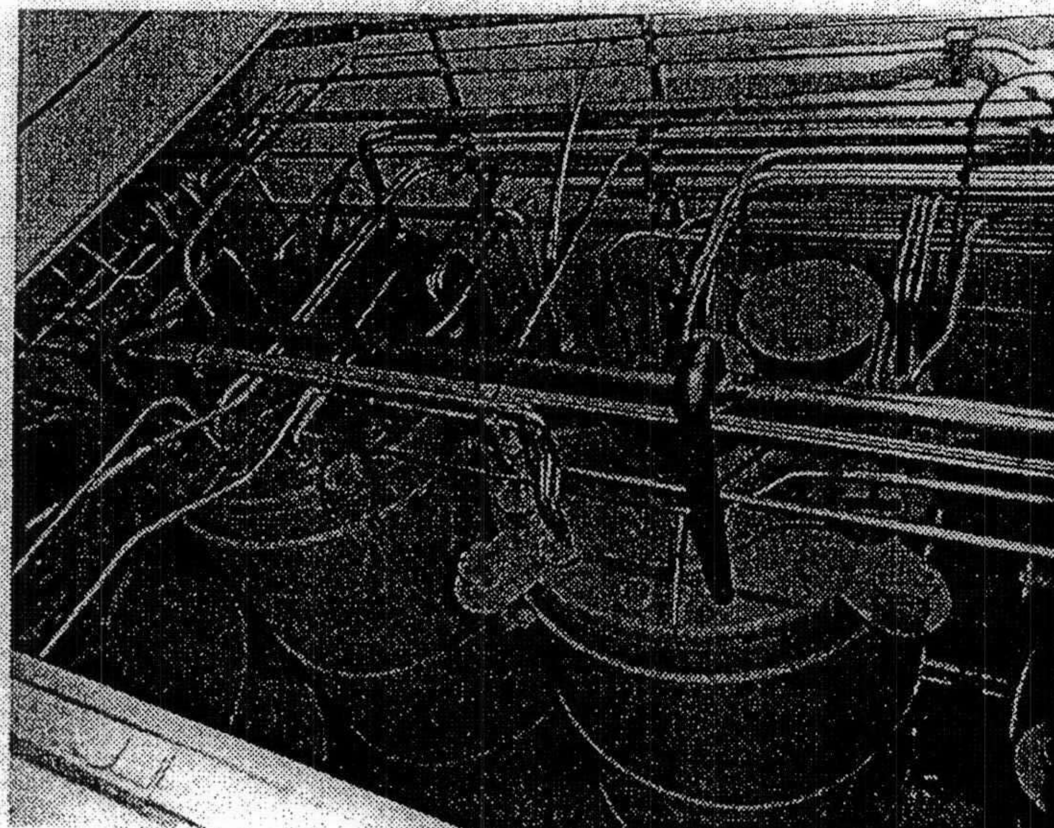


Figure 2-13. 324 Building LLV Construction Photograph.

This page intentionally left blank.

Table 2-1. Areas of the Building Pursuing Closure.

Area	Require Closure Activities	Components for Closure
A-Cell	No	None
B-Cell	Yes	Dispersible material and debris, liner, concrete
C-Cell	No	None
D-Cell	Yes	Waste container storage area; HLV liquid treatment process equipment area
Airlock	Yes	Piping from HLV/LLV
Pipe Trench	Yes	Piping from HLV/LLV
HLV	Yes	Four tanks, piping, liner, concrete
LLV	Yes	Four tanks, piping, liner, concrete
HLV sample room (Room 145)	Yes	Piping from HLV and LLV
Cask handling area	No	None
Trucklock	No	None
EDL-146	Yes	Piping from HLV/LLV
Galleries	Yes	Piping from HLV and LLV
Room 18	Yes	Piping from HLV and LLV and potentially concrete surrounding B-Cell shield plugs.

Table 2-2. High-Level Vault Tank Data.

Tank	Capacity	Input	Output
104	15,000 liters	A-Cell cubicles, A-11, A-12; B-Cell cubicles, B-12, B-14; loadout station; C-Cell; D-Cell; pipe trench; LLV tank 102; Tank 107; Tank 105; vault sump	Loadout stall; Tank 105; pipe trench
105	19,000 liters	A-Cell cubicles, A-11, A-12; B-Cell cubicles, B-12, B-14; airlock; loadout station; pipe trench; Tank 106; Tank 104	Tank 104; loadout stall; pipe trench
106	1,700 liters	Loadout station; B-Cell cubicles, B-12, B-14; D-Cell; pipe trench; Tank 107	Loadout stall; pipe trench; Tank 107; Tank 105
107	3,600 liters	Chemical addition line; Tank 106	Loadout stall; pipe trench; Tank 106; Tank 104

Table 2-3. LLV Tank Data.

Tank	Capacity	Input	Output
101	12,800 liters	Process drains: A-Cell cubicles A11, A12; B-Cell cubicles B12, B14; cubicle drains: A-Cell cubicles A11, A12, A21, A22, A31, A32; B-Cell cubicles B12, B14; Room 145 sampler drain; Room 11 drain; loadout stall, pipe trench; tank 108; B-Cell tank 115.	340 Building, tank 102
102	19,000 liters	A-Cell cubicles A11, A12; B-Cell cubicles B12, B14; C-Cell; D-Cell; EDL-146; header in Rooms 146 and 147; tank 108; tank 101; tank 103; trucklock sump; pipe trench; LLV sump	HLV Tank 104; Loadout Station; 340 Building
103	12,800 liters	Loadout station; pipe trench	Loadout stall; pipe trench; header in Rooms 146 and 147; tank 102; tank 101
108	12,800 liters	Room 146 drains; pipe trench	Tank 101; tank 102

This page intentionally left blank.

CONTENTS

CONTENTS (cont)

FIGURES

TABLES

3.0 PROCESS INFORMATION

The 324 Building was constructed in the early 1960s to provide capabilities necessary to perform research and development (R&D) activities associated with waste management, structural material for use in the nuclear industry, and nuclear fuels design and construction. This chapter provides information on the R&D processes and waste management activities that have occurred in the building. Historic process information for all areas included in the closure boundary is presented in Section 3.1. TSD activities either identified in the initial violation (storage of mixed waste in B-Cell and HLV tanks, and subsequently the LLV tanks) or allowed under the consent agreement to close the violations (HLV tanks liquid waste treatment system), are presented in Section 3.2. Finally, past and current removal activities in support of closure and in support of deactivation (for those areas within the closure boundary that do not require action) are presented in Section 3.3. The actual closure activities for portions of the 324 Building undergoing closure are described in Chapter 7.0.

Information included in this chapter was gathered through discussions with knowledgeable building personnel, searches of existing building operating records, reports including the *Integrity Assessment Plan for PNL 300 Area Radioactive Hazardous Waste Tank System,* (SAIC 1993), and PNNL documents prepared during operations. Many operational records are no longer available (for instance, archive files before 1998 for tank-to-tank liquid transfers cannot be found).

3.1 WASTE PRODUCING PROCESSES

Liquid and solid radioactive and mixed waste has been generated during the conduct of various programs within 324 REC. Liquid waste generated within the REC has been discharged at various times to the HLV tanks and LLV tanks. The waste consisted of solutions generated during R&D activities and solutions from radiological decontamination activities. Solution transfers occurred through piping between various tanks in the HLV and LLV and the REC cells. Solutions from the LLV tanks can be discharged to the 340 Building. While the piping system has been designed so that solutions can be transferred from the LLV tanks to the HLV tanks, solutions cannot be transferred directly from the HLV tanks to the LLV tanks.

Solid materials classified as waste also were generated in the REC cells during this time. Solid material was and still is packaged in U.S. Department of Transportation or DOE approved packages and transferred to burial grounds or storage facilities in the 200 Area. Most of the solid material classified as waste generated in the REC Cells was LLW. After 1988, solid materials classified as containing dangerous waste, such as radioactively contaminated lead brick, lead shot, and process rack components that contained lead for counterbalance purposes, were packaged separately from LLW and transferred as mixed waste (MW) to the Central Waste Complex in the 200 West Area.

The following R&D projects and programs have been conducted in the identified closure plan boundary areas since construction of the 324 Building:

A-Cell
- Waste Solidification Engineering Prototype Program (WSEP)
- Nuclear Waste Vitrification Project (NWVP)
- Federal Republic of Germany (FRG) Program (Production of Sealed Isotopic Heat Sources)

B-Cell

- Waste Solidification Engineering Prototype Program (WSEP)
- Nuclear Waste Vitrification Project (NWVP)
- Zeolite Vitrification Demonstration Project (ZVDP)
- Testing and Operation of the Radioactive Liquid-Fed Ceramic Melter (RLFCM)
- Federal Republic of Germany (FRG) Program (Production of Sealed Isotopic Heat Sources)

C-Cell

- Waste Solidification Engineering Prototype Program (WSEP)
- Waste Fixation Program
- Spent Fuel Handling and Packaging Program
- Waste Isolation Program

D-Cell

- Waste Solidification Engineering Prototype Program (WSEP)
- Waste Fixation Program
- Spent Fuel Handling and Packaging Program
- Materials Characterization Center Program
- Commercial Spent Fuel Management Program
- High-Level Vault Interim Removal Action Project

3.1.1 A-Cell

Between 1966 and 1972, A-Cell was used to perform radiological and physical measurements of glass canisters produced throughout the Waste Solidification Engineering Prototype (WSEP) program (see Section 3.1.2.1). Waste generated in the cell were radioactive only and classified as LLW. From 1972 to 1982, the cell was used as a storage area for WSEP glass canisters. In 1982, the cell was used to perform radiological and physical characterization of glass canisters produced during the Nuclear Waste Vitrification Program (NWVP). Waste generated during the NWVP characterization work were classified as LLW. No work was performed in the cell from 1982 to 1985.

In 1977, after discovery of a leak in the ventilation duct space under A-Cell, a test was conducted to determine the integrity of the cell sump and stainless steel floor liner. The sump and liner were flooded with water containing dye. The ventilation duct space was monitored for evidence of the dye solution, with negative results.

It should be noted that A-Cell has a mild steel wall liner that is butt welded to the stainless steel floor liner. The weld occurs approximately 1.5 meters above the floor. The mild steel wall liner consists of seam welded plates that run up to the crane rail level. There is no seal between the mild steel liner and the concrete wall at the crane rail. This makes it possible for solutions used to decontaminate the A-Cell crane in the REC airlock to run down the crane rails into A-Cell, and run down the wall between the concrete and the mild steel liner. Administrative controls were put in place in 1980 to ensure that dams were put in place on the crane rails in the REC airlock to prevent water running into the cell during decontamination activities at crane rail height in the REC airlock.

A-Cell was cleaned and refurbished in 1985 before the installation of the FRG Program (Production of Sealed Isotopic Heat Sources) electropolisher and water-cooled FRG canister storage rack. In 1988, a total of 34 FRG canisters were electropolished, and stored in the cell (see Section 3.1.2.6). Canisters were stored until 1997, when the canisters were repackaged in storage casks and transferred to a dry storage area in the 200 Area the Central Waste Complex.

Electropolishing was the only activity performed in A-Cell that produced dangerous waste. Canisters produced during the FRG Program were electropolished in 85 wt% phosphoric acid. The electropolishing process removed about 1 kg of surface metal and contaminants per canister (refer to Chapter 4.0 for analytical information on this material). The electrolyte, phosphoric acid, contained trace amounts of chromium and nonregulated radiological constituents cesium-137, and strontium-90. In October 1988, 2,463.5 liters of this solution were transferred to LLV Tank 102, where the solution was neutralized and transferred to the 340 Building. The electropolishing tank in A-Cell was made a less-than-90-day storage area until the waste was containerized and transferred to the Central Waste Complex. The tank was triple-rinsed in October 1988 as part of the waste retrieval process.

3.1.2 B-Cell

B-Cell was used to demonstrate chemical engineering pilot-scale processes for radioactive waste management programs. These programs left B-Cell filled with equipment that is highly contaminated with radioactive waste, radioactive materials, and materials that have been designated as mixed waste. Additionally, B-Cell contains dispersible (i.e., easily spreadable) material containing mixed-waste contaminants (heavy metals).

The majority of mixed waste producing activities of concern for closure occurred in B-Cell. The B-Cell activities are summarized in Table 3-1. Periods listed as 'no activity' indicate that no project or R&D activities were occurring in the cell during that time.

3.1.2.1 Waste Solidification Engineering Prototype Program

The WSEP program was the first program to be performed in B-Cell. The WSEP program began in 1966 and continued through 1972. The program was designed to demonstrate three methods of solidifying highly radioactive waste: pot solidification, spray solidification, and phosphate glass formation.

3.1.2.1.1 Pot Solidification

Two separate processes were considered pot solidification methods: pot calcination and rising level glass. In the pot calcination method, the waste was fed into a heated pot and concentrated to a salt cake by elevating the temperatures. The salt cake was then heated to 900^0 C to decompose the residual nitrates, which resulted in the final product of a soluble calcine comprised primarily of oxides. Escaping vapors from the process were condensed and collected; noncondensibles were filtered and released as airborne effluents.

The rising level glass method consisted of feeding a liquid waste along with glass-forming materials into a stainless steel pot heated to 900^0 C. A melt took place, creating three layers in the pot: fluid glass, calcine (sinter), and a waste liquid on the top. The feed rate of the liquid waste and glass formers was varied such that the resulting liquid and calcine layers were at a minimum. Once the container was full with 100 percent fluid glass, the pot was cooled to allow solidification. Off gasses from this process were condensed and collected; noncondensibles were filtered and released as airborne effluents.

3.1.2.1.2 Spray Solidification Process

The basic operations accomplished in spray solidification were: (1) conversion of aqueous waste solution to finely divided oxide powder by spray calcination, and (2) formation of a melt (glass) that solidified to a coherent mass that was physically stable and chemically inert. Melting was performed directly in the receiver canister (in-can melting).

The first step of the process was to feed the liquid through a pneumatic atomizing nozzle into the top of the spray calciner. As the spray traveled down the heated portion of the calciner, the solution was dried into a powder. The powder, or calcine, fell directly into the in-pot melter. Flux materials and silicate were added to the in-pot melter to ensure formation of durable glass. Depending on the types of waste used and the desired characteristics, the following different fluxes were used, either alone or mixed with another: P_2O_5, oxides of Li-Na-Al, CaB_2O_3(colemite), B_2O_3, and SiO_2. The waste powder, flux material, and silicate were melted at a temperature between 700 to 1,200^0 C. Once a canister was full, the canister was cooled and sealed for storage.

3.1.2.1.3 Phosphate Glass Process

The phosphate glass process was carried out in two continuous steps: (1) a low-temperature (120 to 140^{0}C) concentration step in which aqueous waste, chemically adjusted by the addition of phosphoric acid together with certain metal salts (when required), was continuously concentrated and partially denitrated to a thick slurry, and (2) a high temperature (1,000 to 1,200^{0}C) glass-forming step in which final removal of water, nitrates, and other volatile constituents was accomplished. When the receiver canister was full, the canister was removed, sealed, and taken to storage.

The WSEP Program was designed to investigate treatability processes for defense production waste. The feed-material compositions used in the WSEP program were prepared to demonstrate the bounding conditions relative to glass forming for simulated waste streams representative of: (1) PUREX process waste solution that contained a large amount of iron, such as would result when an iron canister is used to transfer nuclear fuel elements and the canister was co-dissolved with the nuclear fuel and (2) a PUREX process waste solution optimized to produce a waste containing a minimum quantity of nonfission product material. Several elemental substitutions were made for the fission products. Elements present in the WSEP feed included molybdenum, nickel, cobalt, copper, potassium, rubidium, iron, and aluminum.

3.1.2.2 Period of No Activity

WSEP Program activities were completed in 1972. From 1972 to 1976, no activities occurred in B-Cell other than required minimum safe surveillance and maintenance activities such as ventilation filter changes. Only solid LLW, such as expendable personal protective equipment and plastic sheeting used during high contamination area entries, was generated during this time.

3.1.2.3 Nuclear Waste Vitrification Project

The NWVP provided a demonstration of the vitrification of the liquid high-level waste (HLW) stream highly radioactive liquid waste from spent nuclear fuel that was discharged from an operating light water reactor.

The objective of the NWVP was to provide a demonstration of the vitrification of liquid HLW from spent fuel discharged from LWR. The NWVP encompassed two tasks of the Commercial High-Level Waste Immobilization Program: waste preparation and demonstration of vitrification of HLW. The project was started in April 1976 and was terminated in June 1979. In preparation for the project, some canister inspection equipment was demolished and removed from B-Cell as LLW. A dissolver system was installed in B-Cell to dissolve the commercial spent fuel, and piping was added to the pipe trench and HLV tanks to allow transport of dissolved spent fuel and reprocessing HLW to and from the neighboring 325 Building.

The NWVP involved equipment in both 324 and 325 Buildings. The 324 Building was used for fuel unloading, fuel disassembly, shearing, dissolving, waste calcination and vitrification. Solvent extraction with 30 percent volume tri-butyl phosphate in a normal paraffin hydrocarbon diluent (rendering the solvent immiscible with the aqueous based dissolver solution), and ion exchange processes on the dissolved fuel were performed in A-Cell of the 325 Building before transferring the resulting HLW back to the 324 Building. A triple encased underground pipeline between the two buildings served to transfer dissolver solution to the 325 Building, and HLW from the 325 Building to the 324 Building (refer to Chapter 2.0, Section 2.3.1.6.1).

Commercial LWR fuel assemblies were received in the trucklock unloading area in approved shipping casks. The fuel assemblies were transferred into B-Cell for storage and disassembly. For disassembly and shearing, the fuel pins were withdrawn from the fuel assembly in groups of five, and fed to a hydraulic shear. The cut fuel pieces dropped down a chute into a basket located inside the dissolver vessel Tank 127 (removed in 1984). After a period of time to allow for dissolution of the spent fuel, the dissolver solution (nitric acid) was filtered and sent to holding Tank 126 (removed in 1984). The dissolver solution was transferred from Tank 126 to A-Cell in the 325 Building through the interbuilding pipeline.

After processing, the resulting dilute HLW feed was transferred back through the interbuilding pipeline to HLV Tank 106 in the 324 Building. The HLW was transferred to Tank 107, where the chemical composition was adjusted to that of typical waste by the addition of uranium and nonradioactive chemicals. Inert chemicals added to the HLW in Tank 107 were: $NaNO_3$, $Fe(NO_3)\text{-}9H_2O$, $Cr(NO_3)\text{-}9H_2O$, $Ni(NO_3)\text{-}6H_2O$, and H_3PO_4 (75 percent). The waste feed material was transferred to B-Cell feed Tank 114, and to evaporator Tank 113 to adjust the acid concentration and volume for the vitrification process. The concentrated solutions from the waste feed preparation process were used for the two batch operations of the spray calcine/in-can melter system. Glass forming compounds added to the HLW calcine during the vitrification process were SiO_2, Na_2O, B_2O_3, TiO_2, Li_2O, MgO, ZrO_2, and La_2O_3.

During 1979, the spray calciner was plugged with calcined material during a melting run. During efforts to unplug the calciner, several kilograms of calcine dropped out of the calciner and ended up on the floor of B-Cell. This calcine is part of the dispersible material present today in B-Cell.

Because of the high radioactivity of the glass logs produced, the logs were designated as SCW with no identified disposal path. After negotiations with the Ecology in 1995 and subsequent revision of the Hanford Facility RCRA Permit (Ecology 1994), the glass logs were transported for storage to the PUREX Storage Tunnels.

3.1.2.4 Period of No Activity

NWVP activities were completed in 1979. From 1979 to 1981, no activities occurred in B-Cell other than required minimum safe surveillance and maintenance activities such as ventilation filter changes. Only solid LLW, such as expendable personal protective equipment and plastic sheeting used during high (radiological) contamination area entries, was generated during this time.

3.1.2.5 Zeolite Vitrification Demonstration Project

ZVDP was designed to demonstrate that zeolite ion exchange resins could be vitrified as an alternate means to immobilize radionuclides present in the resin for storage. ZVDP was started and completed in 1981.

Zeolite ion exchange resin that had been used to sorb radioactive strontium and cesium from waste water at the Three Mile Island site were used in the demonstration. Equipment was fabricated and placed in B-Cell to allow the dry zeolite to be mixed with dry glass formers and fed to a canister inside an in-can melter. Glass formers used in the process were SiO_2, Na_2O, B_2O_3, TiO_2, Li_2O, MgO, ZrO_2, and La_2O_3. A total of five resin beds were received and used in the demonstration, which produced eight glass logs. Because of the high radioactivity of the glass logs produced, the logs were classified as SCW for which no disposal pathway existed. After notification to the Ecology and revision of the Hanford Facility RCRA Permit in 1995 (Ecology, 1994), the glass logs were transferred to the PUREX Storage Tunnels.

3.1.2.6 Pilot Scale Radioactive Liquid-Fed Ceramic Melter Testing Task

The RLFCM testing task including the installation and testing of the ceramic melter in B-Cell occurred from 1982 to 1986. Existing equipment in the cell, including dissolver tanks installed for the NWVP, the spray calciner system, two in-can melting systems, fuel disassembly table, glass canister storage tank, and ZVDP equipment were demolished and shipped as LLW to the burial grounds in the 200 Area to make room for the turntable/melter and auxiliary equipment racks necessary for the process.

RLFCM program consisted of a ceramic melter capable of handling liquid slurries of waste directly. Waste slurries were fed into the top of the melter, where liquids in the slurry were flash evaporated. The waste formed a crust of material that floated on top of a layer of molten glass. The crust gradually would melt to fusion temperatures, joining the molten glass beneath. An air lift system was incorporated into the melter to allow periodic draining of the molten glass pool formed in the melter. Molten glass was poured into stainless steel canisters moved beneath the melter discharge by a turntable system. The system allowed continuous production of glass during a melter run.

A liquid metal seal was used to seal the ceramic melter to the turntable system so that negative pressure could be maintained on the entire system. The seal consisted of an alloy with low melting characteristics (refer to Chapter 4.0 for description of alloy). The alloy was contained in a unit that was installed on the turntable. The unit consisted of a circular trough filled with the low temperature alloy, and steam lines that surrounded the trough. After installation of the unit on the turntable, steam was circulated through the steam lines. The heat of the steam melted the low temperature alloy, creating a pool of liquid metal. The melter air lift system was lowered into the liquid metal pool, and bolted in place on the melter. After steam was shut off to the liquid metal seal unit, the metal solidified, forming an excellent seal to the air lift system that could be easily breeched by simply heating the low temperature alloy with steam. The liquid metal seal unit allowed easy maintenance or equipment replacement of both melter and turntable components.

Two auxiliary racks also were installed in the cell. The feed rack consisted of two feed tanks in which the waste slurry was prepared and fed to the melter system. The melter off gas rack contained condensers and scrubbing systems necessary to control the volumes of vapors discharged from the melter system. The melter off gas rack was connected to the existing off gas handling equipment in the cell, while the feed rack was connected to in-cell process tanks associated with feed preparation.

RLFCM was made operational in 1985. Testing of the RLFCM included a 'cold run' in which no radionuclides were included in the feed, and a 'hot run' in which depleted uranium and natural thorium oxide were added to the feed. Details of the composition of feed material are provided in Chapter 4.0. A total of four canisters of glass were produced during RLFCM testing. After testing, the RLFCM was used to produce the heat and radiation sources for the FRG Program. These four canisters subsequently were stored in A-Cell pending completion of the FRG Program (refer to Section 3.1.2.6.2).

3.1.2.6.1 Fabrication of Cesium and Strontium Heat and Radiation Sources Program

In 1986 through 1987, the RLFCM task produced 30 isotopic heat sources in canisters for FRG to be used as part of a repository testing program. These activities, which frequently are referred to as the FRG Program, involved the filling, closure, and decontamination of the 30 canisters. The canister filling and decontamination processes used the vault tanks for feed waste solution, process condensates, and decontamination solutions as described in the following sections.

3.1.2.6.2 FRG Canister Filling

During three separate processing campaigns (RLFCM-7, -8, and -9), canisters were filled using the radioactive liquid-fed ceramic melter to produce a borosilicate glass. Feed materials for these campaigns were cesium-137 and strontium-90 laden nitrate solutions from B Plant Complex. Details of the composition of feed materials are provided in Chapter 4.0. The original feed stock solutions were made from cesium-137 chloride capsules fabricated at WESF and strontium-90 fluoride. Capsule contents, including impurities such as lead, chrome, and traces of plutonium (in the strontium capsules only), were converted to nitrate solutions before being transferred from the B Plant complex to the 324 Building. Residual halides (in small quantities) were expected in the waste feed solutions. The waste feed solutions were stored in HLV tanks 104 and 105. Waste feed solutions were batch transferred from Tank 104 and Tank 105 to Tank 112, where the temperature was controlled and monitored and the solution was agitated. The contents of Tank 112 were transferred to the evaporator Tank 113 for denitrification (addition of formic acid) and volume reduction. The concentrated product from Tank 113 was transferred to feed makeup Tank 114, where nonradioactive glass-forming chemicals were added. The resulting feed slurry was sent to the RLFCM feed rack, where the slurry was fed into the RLFCM and melted to form a borosilicate glass.

A total of 30 canisters were filled with glass during the three RLFCM campaigns. The canisters were unloaded from the turntable and transported to A-Cell for installation of a welded lid, decontamination, and storage. During 1986, melter feed that consisted of a nitric acid solution that contained cesium, strontium, and impurities including lead, chrome, and plutonium spilled onto the floor of B-Cell and evaporated. The resulting dry material was conservatively assumed to be dispersible. These 30 canisters and the four produced in the earlier RLFCM task were loaded in storage casks and transferred to a storage area in the Central Waste Complex.

3.1.2.7 Auxiliary Effluent and Process Feed Handling Systems

The PUREX off gas handling system in B-Cell was in service from 1966 through 1987. Major parts of the system were unchanged during that time, although replacement of several condensers in the system and addition of another off gas scrubber rack occurred between 1984 and 1985 as part of an equipment upgrade to support the RLFCM testing task and FRG Program.

The process feed handling system is interrelated to the effluent handling system. Process feed stocks were cycled through the effluent handling system, principally the evaporator and fractionator, to prepare the feed for introduction to the melting systems. This system consists of two process tanks and transfer piping.

Process auxiliaries necessary for operation of the melter systems tested in B-Cell consist of equipment for (1) preparing aqueous waste solutions for feeding the melter systems, (2) decontaminating the melter system off gas, and (3) decontaminating the melter system condensate and recovering nitric acid.

Effluents generated from vitrification (glass-making) processes consisted of volatilized material from the feed, entrained liquid or solid aerosols, and process air. The volatilized materials consisted primarily of water, nitric acid, various oxides of nitrogen, and a small amount of ruthenium tetroxide (RuO_4). Noncondensible constituents in the melter system off gases were discharged to the atmosphere after treatment by in-cell process off gas scrubbers and HEPA filtration.

In the 324 Building auxiliary system, vapors from the melter systems were routed through a condenser to the evaporator. The condensate was concentrated in the evaporator. Entrained aerosols in vapors from the evaporator were removed in the evaporator tower by impingement plates, bubble caps, and a mist eliminator, and recondensed. The evaporator condensate was concentrated in the acid fractionater where nitric acid was recovered. Vapors from the fractionater were again condensed; about 80 percent of the fractionater distillate was recycled to the evaporator as acid stripwater, while the remaining 20 percent was discharged to storage in HLV tanks. Remaining off gasses were treated by in-cell HEPA filtration, run through a scrubbing system, and through additional HEPA filtration (both in the process off gas blower room and the building zone 1 ventilation system) before being discharged to the atmosphere. Figure 3.1 illustrates the effluent treatment auxiliary system.

The effluent treatment auxiliary system included Tank 113 (evaporator), Tank 115 (fractionater), Tank 116 (fractionater distillate receiver), and Tank 118 (scrubber) located in B-Cell of the 324 Building. The following describes process routes for liquid effluent discharges in this system.

The major process route for Tank 113 was transfer of concentrated effluent to Tank 112 or Tank 114 (feed tank) for immediate use in the vitrification process or transfer of concentrated effluent to HLV Tank 104 for future use. Process routes for reclaimed acid from the fractionater (Tank 115) was to HLV Tank 105 for storage, or to Tank 116 or process condensers for condensate pH adjustments. Vapors from the evaporator (Tank 113) were sent through two stages of condensing before discharge to the fractionater distillate (strip water) receiver tank (Tank 116). Process routes for effluent discharge from Tank 116 was to LLV Tank 101 or Tank 108 (condensate storage), to LLV Tank 102 (condensate sample and storage), to the fractionator Tank 115 as makeup solution, and to process condensate collector Tank 117. Liquid effluent discharges from Tank 118 (scrubber bottoms) were sent to HLV Tank 104.

The spray calciner/in-can melter system used during WESP and NWVP could receive feed from the interconnected utility Tank 112 (evaporator feed tank) and Tank 114 (calciner feed tank). Tank 112 received feed material from HLV Tank 104, Tank 105, and Tank 107 or the evaporator (Tank 113) and discharged to the evaporator or Tank 107. Tank 114 received material from HLV Tank 107 and discharged to the melter system or Tank 105. Although not used between 1966 and 1987, additional piping present in tanks 112 and 114 went to rack face connections, which allowed process connections to be made to other equipment. One of these lines from Tank 112 was used to connect a vacuum transfer system to D-Cell to facilitate treatment of HLV tanks solutions in 1996 (see Section 3.2.4).

3.1.3 C-Cell

C-Cell has been used since 1968 for materials characterization work in support of several programs. Most of the characterization work performed involved leaching studies of glass produced during the WSEP Program and spent fuel from various commercial reactors. The leaching studies performed centered around characterization of groundwater effects on waste forms. Leachates used were distilled water, onsite groundwater, brines, and some carbonate buffered aqueous solutions. Programs supported include WSEP, the Waste Fixation Program, Spent Fuel Handling and Packaging Program, and the Waste Isolation Program.

In 1977, after discovery of a leak in the ventilation duct space under C-Cell, a test was conducted to determine the integrity of the cell sump and stainless steel floor liner. The sump and liner were flooded with water containing dye. The ventilation duct space was monitored for evidence of the dye solution, with negative results.

Equipment in C-Cell was removed and the cell decontaminated in 1989. Since 1989, C-Cell has been used for R&D activities of spent fuel and target assemblies. In addition, equipment was installed in 1996 to perform treatability studies on waste tank sludge from the 200 Area.

3.1.4 D-Cell

Work activities performed in D-Cell include preparation of WSEP glass samples for analysis, characterization, sectioning, and sample preparation of commercial spent fuel samples, and production of glass standards for the Materials Characterization Center Program; spent fuel heat and radiation degradation studies for the Commercial Spent Fuel Management Program; and operation of equipment used during the HLV Liquids Interim Action Project. Solid LLW materials were produced during these activities and transferred to the burial grounds in the 200 Areas. Lead used for shielding and counterweights was classified as low-level mixed waste and transferred the Central Waste Complex.

A radioactive liquid waste leak was detected in 1977 under C-Cell. At the time, D-Cell operations performed work for the Materials Characterization Center Program involving strontium-90 fluoride. In performing cell cleanup during operations, water was siphon jetted from the sump present in the cell. Several days later, while performing work in the ventilation duct space under C-Cell, liquid containing high levels of radiation was noted as leaking from a crack in the concrete ceiling of the crawl space (actually the floor of C-Cell). The immediate assumption was that there was a leak in either C-Cell or A-Cell that was causing the liquid leak in the ventilation duct space. A leak test was conducted in C-Cell and A-Cell. The sumps and floor areas were flooded with a dye solution and left for an extended period, then siphon jetted to HLV Tank 104. The test showed that the sumps and stainless steel floor liners were intact in both C-Cell and A-Cell.

After further investigation, a determination was made that the source of the leak was a transfer line that was used to jet the contents of the D-Cell sump to the LLV tanks. This was confirmed through analysis of the leaking solution, which showed high levels of strontium-90. The only work occurring with strontium-90 was in D-Cell. It was assumed that the line, which is imbedded in the concrete walls of both C-Cell and D-Cell, failed for unknown reasons. Liquid being carried in the line during jetting operations leaked into the concrete, finding an exit in a crack in the concrete ceiling of the C-Cell crawl space.

The suspect line was isolated to prevent further use, and another transfer line was designated for use during future sump jet operations. Additionally, catch trays were installed in the ventilation duct space to catch any leaking liquid in the event that a similar leak occurred in the future. The catch trays drain to the HLV sump, which is monitored for liquid level. No liquid level alarms attributable to leaks in the crawl space have occurred (refer to Section 3.2.9.1 for a discussion of free liquids in the HLV).

The D-Cell has a significant nonregulated inventory. The fuel pin inventory of D-Cell consists of approximately 50 kilograms of BWR and pressurized water reactor SNF rod segments and fuel pellets contained in two spent fuel storage containers.

There are five strontium filters encased in specially designed stainless steel canisters, nine ion exchange columns encased in specially designed stainless steel canisters, and one transuranic (TRU) column encased in a specially designed stainless steel canister. The filters and ion exchange columns are part of the HLV Liquid Waste Interim Removal Project residual waste stream. Both the SNF and HLV filters and columns will be removed before closure.

3.1.5 Airlock

The airlock allows for access to the four REC (A-, B-, C-, and D-Cells) and the pipe trench, and is used primarily as a transition zone for maintenance, and for transfer of material and equipment into and out of those areas. The airlock is used for final radiological decontamination of containers before releasing to the cask handling area (Note: Packages are decontaminated in B Cell before entering the airlock. Decontamination in the airlock is required because of the airborne nature of radiological contaminants within B-Cell). The decontamination solutions currently gravity flow to the pipe trench. In Chapter 7.0, Section 7.1.5 addresses closure activities for the airlock and Table 7-1 lists specific piping to be isolated to accomplish the isolation of the airlock and pipe trench from the HLV.

3.1.6 Pipe Trench

The pipe trench was used to make utility, process, and waste handling piping connections between the cells and the HLV tanks. Process and waste handling piping runs between the pipe trench, HLV and LLV tanks, and B-Cell. The pipe trench will be isolated from the HLV.

The pipe trench also was designed to contain water used for decontamination of external surfaces of containers with radiological contaminants above packaging requirements (primarily caused by airborne contamination during transfer of container from in-cell to the airlock) in the REC airlock, and radiological decontamination of the airlock itself. The liquid collected in the bottom of the trench. The pipe trench was equipped with a steam jet that enabled solutions collected in the trench to be transferred to LLV Tank 102. The steam jet ceased functioning in 1985. Since 1985, collected water has been managed by monitoring the pipe trench level, and curtailing use of water in the airlock if levels reach an administrative control level. Alternatively, a pump was connected to tubing running into the pipe trench. The outlet for the pump is connected to a line that passes through a shield plug in the airlock into B-Cell.

3.1.7 Other 324 Building Areas

Four other areas of importance are within the closure boundary: cask handling area, the trucklock, the EDL-146, and the galleries.

3.1.7.1 Cask Handling Area

The cask handling area is used for equipment and cask storage. No dangerous waste activities take place in the cask handling area. However, packaged waste does pass through the cask handling area to exit the building.

3.1.7.2 Trucklock

The trucklock provides access into and out of the 324 Building for all radioactive material. The area consists of a loading bay accessible by truck or rail car, and a radioactive liquid loadout stall used to transfer radioactive liquids into or out of the facility using appropriate transport casks. The loadout stall is a shielded and ventilated cubicle that contains piping connections and valve manifolds that allowed routing of liquids to or from the HLV and LLV tanks. It was last used during the production of sealed isotopic heat sources for the FRG Program to transfer radioactive cesium and strontium solutions to HLV tanks 104 and 105 in 1986.

The trucklock contained a less-than-90-day storage area periodically used as a staging area for contact-handled mixed waste. The trucklock also contains satellite accumulation areas that are used to accumulate contact-handled mixed waste from the REC. All mixed waste is packaged for radiological contamination control before being brought into the trucklock area.

3.1.7.3 Engineering Development Laboratory-146 (Room 146)

The EDL-146 has been used for bench and pilot-scale process development activities. EDL-146 has contained satellite accumulation areas and less-than-90-day storage areas. No TSD activities have occurred in the EDL-146.

The Sodium Removal Pilot Plant, which was located within the EDL-146, was a RCRA permitted treatment facility that underwent Procedural Closure pursuant to the requirements of the Tri-Party Agreement, Section 6.3.3. The Sodium Removal Pilot Plant will not be addressed by this closure plan except that piping to the LLV tanks will be isolated and will undergo closure activities (Chapter 7.0, Section 7.3).

3.1.7.4 Operating Galleries

The operating galleries are radiologically controlled areas for use by personnel working with material in the REC. The galleries include locations for operating remote manipulators connected to the cells, view ports into the cells, access to the cell cubicles, and pass-through ports from the REC.

The galleries are of concern for closure because of the pipes (steam lines, air lines, and chemical addition lines) that run from the second floor gallery into B-Cell and the HLV tanks. Connections in the operating gallery allow for different combinations of air, steam, and chemicals to be used depending on the operations required in B-Cell and the HLV tanks.

The chemical addition lines were used during the HLV tanks treatment process to add the chemical rinse solutions. These lines were flushed following use, and therefore, no chemical residues are expected in these gravity flow lines.

3.1.7.5 Room 18

Room 18 is a support area located in the basement adjacent to B-Cell. Room 18 is a concern for closure because of piping from B-Cell and the potential for the concrete surrounding the B-Cell shield plugs to be contaminated with mixed waste.

3.1.8 Other Components

Other areas of concern to the closure are the pass-through ports and the cubicles.

3.1.8.1 Pass-through Ports

Pass-through ports were used to support transfer of special tools and services for cell operations. No specific waste generation or waste handling were specifically associated with the ports.

3.1.8.2 Cell Cubicles

The A-Cell cubicles (A-11, A-12, A-21, A-22, A-31, A-32) and B-Cell cubicles (B-12 and B-14) were used to make process connections into the cells. No specific waste handling process was associated with the cubicles. In all eight cubicles, cubicle drain lines run directly to the LLV Tank 101. Also, process lines run through the cubicles to the LLV tanks 101 and 102, to the HLV tanks 104 and 105, and to other hot cells.

3.1.9 High-Level Vault and Low-Level Vault

The following sections describe the processes associated with the tanks contained in the HLV and LLV Vault. Tank configuration and lineups also are described. All the discharge points to the vault tanks currently have administrative controls. The current tank piping configuration is shown in Figures 3-1 through 3-8.

3.1.9.1 High-Level Vault

Before the cessation of processing activities in 1988, the HLV tanks were used for the storage of highly radioactive process feed solutions, distillates from in-cell vitrification processes, and nitric acid recovery. HLV tanks also were used to collect liquid effluent from the in-cell sumps and to receive highly radioactive liquids transferred through the loadout stall in the trucklock (refer to section 3.1.2). The HLV Interim Waste Removal Action project drained and flushed the tanks in 1996.

3.1.9.1.1 Tank 104

Tank 104 was able to receive solutions from C-Cell, D-Cell, A-Cell cubicles A-11 and A-12, B-Cell cubicles B-12 and B-14, the loadout stall; HLV sump; and HLV tanks 105 and 107 and LLV Tank 102. The contents of Tank 104 were transferred to the loadout stall and Tank 105. There also are process connections to and from Tank 104 and the pipe trench (Figure 3-1).

Tank 104 stored cesium nitrate solution containing trace amounts of heavy metals received from B Plant complex to support the FRG Program (Section 3.1.2.6). Information on the chemical composition of the solution is presented in Chapter 4.0, Section 4.2. Since 1988, transfers have occurred from Tank 104 to Tank 105, Tank 112, and Tank 107. Periodic additions of water have historically been made to Tank 104 to maintain liquid level above the instrument lines in the tank. Although no documented evaporation calculations are available, the loss of liquid level in the Tank is suspected to be from evaporation. Evaporation occurring in ventilated tanks is not unusual. Other tanks in the HLV were experiencing an equivalent liquid level reduction at the time. Additionally no incident of a HLV sump alarm was noted during this period, which would be expected if the Tank was leaking into the vault.

3.1.9.1.2 Tank 105

Tank 105 was able to receive solutions from tanks 104 and 106, A-Cell cubicles A-11 and A-12, B-Cell cubicles B-12 and B-14, the loadout stall, and the airlock. The contents of Tank 105 were transferred to Tank 104 and the loadout stall. There also are process connections to and from Tank 105 and the pipe trench (Figure 3-2).

Tank 105 stored strontium nitrate solution containing trace amounts of heavy metals received from B Plant complex to support the FRG Program (Section 3.1.2.6). Since 1988, transfers have occurred to Tank 105 from Tank 104 and Tank 107. Periodic additions of water have historically been initiated to Tank 105 to maintain liquid level above the instrument lines in the tank. Although no documented evaporation calculations are available, the loss of liquid level in the tank is suspected to be from evaporation. Evaporation occurring in ventilated tanks is not unusual. Other tanks in the HLV were experiencing an equivalent liquid level reduction at the time. Additionally, no incident of a HLV sump alarm was noted during this period, which would be expected if the tank was leaking into the vault.

3.1.9.1.3 Tank 106

Tank 106 was able to receive solutions from Tank 107, the loadout stall, B-Cell cubicles B-12 and B-14, and D-Cell. The contents of Tank 106 were transferred to the loadout stall and tanks 105 and 107. There are process connections between Tank 106 and the pipe trench (Figure 3-3).

Tank 106 was used to receive dilute HLLW from the 325 Building via the interbuilding pipeline. The interbuilding pipeline was used to transfer dissolver solution to the 325 Building and used to transfer dilute HLLW from the 325 Building to Tank 106. Connections between the interbuilding pipeline and tanks in the building were made in the pipe trench. After receiving the dilute HLLW in Tank 106, the diluted HLLW was transferred to Tank 107 for processing.

There are no recorded transfers of process solutions into or out of this tank since October 1988, except that the tank was rinsed in 1990.

3.1.9.1.4 Tank 107

Tank 107 was able to receive solutions from Tank 106 and from gravity fed chemical addition lines originating in the chemical makeup room on the third floor of the building. The contents of Tank 107 were transferred to the loadout stall and tanks 104 and 106. Tank 107 also can receive and transfer to the pipe trench (Figure 3-4).

Diluted HLW that was used as feed material for the NWVP was stored in Tank 107 (refer to section 3.1.2.3 for further details). Dilute nitric acid was added to Tank 107 on January 31, 1989, May 19, 1989, and November 10, 1989, to maintain liquid level above the instrument lines in the tank and to ensure that products in the material stayed in solution. In January 1990, the solution and subsequent rinse water was transferred to Tank 112 in B-Cell, leaving Tank 107 empty. Tank 112 is a process supplementary tank located in B-Cell process rack 1B. Information on the function of this tank is provided in Section 3.1.2.7. The material was transferred to Tank 112 as the first step in a potential treatment evaluation process that was not performed. The material and rinse water were returned to Tank 107 in November 1992. Periodic additions of water were historically added to Tank 107 to maintain liquid level above the instrument lines in the tank. Although no documented evaporation calculations are available, the loss of liquid level in the tank is suspected to be from evaporation. Evaporation occurring in ventilated tanks is not unusual. Other tanks in the HLV were experiencing an equivalent liquid level reduction at the time. Additionally, no incident of a HLV sump alarm was noted during this period, which would be expected if the tank were leaking into the vault.

3.1.9.2 Low-Level Vault

The LLV tanks were used to accumulate and neutralize various low activity liquid effluents in preparation for transfer to the 340 Building for transfer to in the Double-Shell Tank (DST) System in the 200 Area.

3.1.9.2.1 Tank 101

Tank 101 was able to receive solutions from tanks 103 and 108; Tank 115 within B-Cell; the loadout stall, the process drains in cubicles A-11, A-12, B-12, and B-14, the cubicle drains in cubicles A-11, A-12, A-21, A-22, A-31, A-32, B-12, and B-14; the pipe trench, the sampler drain in the sample room; and the Room 11 drain. The contents of Tank 101 were transferred to Tank 102 or to the 340 Building (Figure 3-5).

Tank 101 was used during process runs to receive condensate from the fractionator distillate receiver in B-Cell. The fractionator distillate condensed vapors coming from the melters. Since 1988, the only solution transfer that occurred to Tank 101 was a partial transfer from Tank 103 in October 1989 (refer to Section 3.1.9.2.3 for further information).

The solution (5,300 liters) that was present in Tank 101 in June 1990 was sampled and analyzed. Between 1990 and 1996, the liquid level steadily decreased; since mid-1996, the tank has been empty. Although no documented evaporation calculations are available, the loss of liquid level in the tank is suspected to be from evaporation. Evaporation occurring in ventilated tanks is not unusual. Other tanks in the LLV were experiencing an equivalent liquid level reduction at the time. Additionally, no incident of a LLV sump alarm was noted during this period, which would be expected if the tank was leaking into the vault.

3.1.9.2.2 Tank 102

Tank 102 was able to receive solutions from tanks 101, 103, and 108; the LLV sump; cubicles A-11, A-12, B-12, and B-14; C-Cell; D-Cell; and the EDL safety showers. The contents of Tank 102 were transferred to HLV Tank 104, the loadout stall, or to the 340 Building (Figure 3-6).

Tank 102 was used to receive condensate from the fractionator distillate receiver in B-Cell via a connection in the pipe trench (refer to Section 3.1.2 for further information). Throughout the life of the building, Tank 102 also was used to collect solutions from decontamination sinks and emergency showers and eyewashes in Rooms 146 and 147 and the trucklock sump.

In October 1988, Tank 102 received a phosphoric acid solution from A-Cell. The material was neutralized and transferred to the 340 Building. In January 1989, Tank 102 received solution from Tank 103 and the solution was transferred to the 340 Building. In November 1990, Tank 102 received C-Cell and airlock decontamination water from Tank 103; the solution was transferred to the 340 Building. In May 1991, Tank 102 received a nitric acid solution containing chromium from Tank 108. The solution was neutralized with sodium hydroxide and transferred to the 340 Building in May 1991, followed by a water flush.

3.1.9.2.3 Tank 103

Tank 103 was able to receive radiological decontamination solutions from C-Cell, the airlock, the loadout stall and the pipe trench sump. The contents of Tank 103 can be transferred to tanks 101 and 102, and the loadout stall (Figure 3-7).

No documentation of the use of Tank 103 during processing is available. However, it is known that Tank 103 was used to receive radiological decontamination solutions from the pipe trench before the pipe trench sump jet line ceased operating in 1989. In November and December 1988, Tank 103 received C-Cell and airlock decontamination water. In January 1989, the contents of Tank 103 were transferred to Tank 102 and to the 340 Building. In January and February 1989, Tank 103 again received solution from the pipe trench that originated from C-Cell and airlock decontamination activities. In October 1989, a partial transfer of solution from Tank 103 was made to Tank 101. In November 1990, the remaining contents of Tank 103 were transferred to Tank 102.

3.1.9.2.4 Tank 108

Tank 108 was able to receive solutions from the EDL-146 drains and the pipe trench (Figure 3-8).

During FRG Program canister fabrication, Tank 108 was used to receive nitric acid from the acid fractionator in B-Cell via a connection in the pipe trench (refer to Section 3.1.2.7 for further information). The solution in Tank 108 was sampled and analyzed in June 1990. In May 1991, the solution was transferred to Tank 102. A water flush of Tank 108 also was sent to Tank 102.

3.2 DANGEROUS WASTE TREATMENT AND STORAGE ACTIVITIES

Dangerous waste treatment and storage activities were and are conducted within the closure boundary including dangerous waste storage within the REC, liquid dangerous waste treatment within D-Cell, and liquid dangerous waste transfer to and from the HLV tanks and potentially to the LLV tanks for storage and/or treatment. The following section describes the activities that were or are being conducted within the specific closure boundary area.

3.2.1 A-Cell

A-Cell did not treat or store dangerous waste, except as a less-than-90-day storage area for electropolisher electrolyte (refer to Section 3.1.1).

3.2.2 B-Cell

B-Cell currently is used to store mixed waste produced during process operations (refer to Section 3.1.2) pending packaging and removal. In addition, process Tank 112 and associated transfer lines were used in the processing and treatment of the HLV tank waste (refer to section 3.2.4). Past waste removal activities associated with the B-Cell Cleanout Project (BCCP) are described in Section 3.3.2. The dangerous and mixed waste generated in B-Cell are described in Chapter 4.0.

3.2.3 C-Cell

C-Cell did not treat or store dangerous waste, except as a less-than-90-day storage area for waste produced during recent tank sludge treatability studies begun in 1996.

3.2.4 D-Cell

D-Cell had been used to store a 208-liter container of mixed waste containing waste mineral oil mixed with diatomaceous earth (adsorbent) from July 1994 until January 1996. This waste was generated in B-Cell from a window leak. The container was removed from D-Cell in January 1996 and transferred to the PUREX Storage Tunnels as SCW.

A portion of D-Cell currently is used to stage HLV tank liquid waste treatment equipment. The waste treatment equipment is being staged in D-Cell in support of 324 Building deactivation and will remain operational until a determination is made that there is no further need for the equipment. The HLV tanks liquid waste treatment involved transferring the waste and rinsates from the HLV tanks to D-Cell via Tank 112 in B-Cell. The treatment process involved the following process, the waste in the HLV tanks was transferred to HLV Tank 104. From Tank 104, the waste was steam jetted to Tank 112 in B-Cell, and vacuum transferred to the waste treatment system in D-Cell. The solutions were adjusted chemically to precipitate the heavy metals present; the precipitates were collected on filters enclosed in specially designed stainless steel canisters. The supernate from the filtration process again was treated chemically by addition of calcium carbonate; this precipitated the strontium-90 present in the supernate. The precipitate was collected for use in the medical isotope program. The supernate from this process was passed through an ion exchange column to collect the cesium-137. After sampling, the remaining low-level liquid was transferred to the 340 Building for subsequent transfer to the 200 Area DST system (refer to Chapter 4.0 for analytical results). The waste treatment system in D-Cell was constructed with drip pans beneath the system to contain any leakage. In addition, the system was maintained under a vacuum (using process vent lines attached to the building HVAC system). This approach helped to contain and minimize the impact of potential leakage as well. Filters contaminated with heavy metals from this treatment process are considered as mixed waste (refer to Chapter 4.0 for details). The filters were collected in D-Cell before being transferred to B-Cell to await transfer to an appropriate TSD unit for storage or disposal.

3.2.5 Airlock

The airlock was not used to treat or store dangerous waste. It is used, however, to perform radiological decontamination of cranes and other equipment from the hot cells before maintenance activities. Solutions generated during decontamination, as well as rinse water used to flush the airlock after decontamination activities, gravity flow to the pipe trench.

3.2.6 Pipe Trench

The pipe trench is not believed to have treated or stored dangerous waste. It was used, however, as a shielded pipe chase to allow transfer piping from the HLV/LLV tanks to connect to service plugs on the 1A, 1B, and 2A racks in B-Cell. In addition, residual dust and dirt from settling of airborne particulates through the airlock and pipe trench have become radiologically contaminated because of decontamination activities carried out in the airlock. Final determination of the existence of this material and subsequent sampling and analysis to determine if dangerous waste constituents exist currently is not feasible because of the piping and drip pans present in the pipe trench. To allow inspection and sampling, piping to the 1A, 1B, and 2A rack plugs must be removed. If sludge is present in the trench and sampling determines that it is dangerous waste, the sludge will require appropriate handling and packaging during pipe trench cleanout (refer to Chapter 7.0).

3.2.7 Other 324 Building Areas

The cask handling area, the trucklock including the loadout stall, EDL-146, and the hot cell galleries, including Room 18, were used to support operations in the hot cells. The trucklock and loadout stall were used to transport radioactive solutions contaminated with heavy metals into the building for use during the production of sealed isotopic heat sources for the FRG Program (refer to Section 3.1.2.6). Piping in the loadout stall associated with radioactive solutions transfers will be included in closure (refer to Chapter 7.0). Radioactive contamination from B-Cell leaked into Room 18 via the lower B-Cell, 5A service plug on three known occasions (in 1977, 1985, and 1988). The radioactively-contaminated water originated from decontamination/flushing operations within B-Cell. Actions were taken to repair/replace the 5A service plug seal and decontaminate the affected wall and floor area within Room 18. No dangerous waste treatment or storage activities took place in these areas.

3.2.8 Other Components

Other areas of concern to the closure are the pass-through ports and the cubicles. These areas did not treat or store dangerous waste.

3.2.9 High-Level Vault and Low-Level Vault

The following sections describe the TSD activities that did or are taking place in the HLV and LLV tanks.

3.2.9.1 High-Level Vault

Material stored in the HLV tanks was considered product material in storage until April 1994. The product material was used to support a number of nuclear materials programs and processes (described in Section 3.1). In April 1994, RL determined that there was no future use for this product material, as the programs involved had been discontinued, and, as such, the product material was classified as mixed waste. The HLV tank liquid waste treatment project drained and flushed the tanks in 1996. Information on sampling and analyses conducted on HLV tanks is present in Chapter 4.0.

There is one documented case of free liquids contained within the liner of the HLV area. On September 7, 1995, liquid totaling 61.7 liters accumulated in the HLV sump, triggering the HLV sump alarm. The source of the liquid was traced to decontamination solution accumulated in the pipe trench from the liquid originated from decontamination activities in the airlock. The decontamination solution was collected in the pipe trench. Because the amount of decontamination solution generated in a short time, liquid levels in the pipe trench were higher than normal, and reached the bottom of a 30.1-centimeters secondary containment pipe that encases transfer piping that runs between the pipe trench and the HLV tanks. A small amount of the decontamination solution ran down the pipe and discharged into the HLV, collecting in the sump.

The level of liquid present in the sump was monitored over a period of a month. The level gradually decreased from 14.4 to 1.0 centimeters. This gradual decrease was consistent with expected evaporation rates, so no leakage from the vault sump is suspected.

After this incident, airlock decontamination methods were modified to ensure that liquid levels in the pipe trench are monitored during decontamination activities. If pipe trench liquid levels approach an administrative maximum, decontamination activities are halted and liquids in the pipe trench are either pumped to B-Cell via the 2A Rack for evaporation or allowed to evaporate in place.

3.2.9.1.1 Tank 104

Material stored in Tank 104 was considered a product material in storage until April 20, 1994, when the RL determined there was no future use for the material and reclassified it as mixed waste. Tank 104 was flushed and drained in 1996 as part of the HLV tank waste removal activity (Section 3.3.9). Tank 104 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.1.2 Tank 105

Material stored in Tank 105 was considered a product material in storage until April 20, 1994, when the RL determined there as no future use for the material and reclassified the product material as mixed waste. Tank 105 was flushed and drained in 1996 as part of the HLV tank waste removal activity (Section 3.3.9). Tank 105 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.1.3 Tank 106

As part of the HLV Tank Liquid Waste Interim Removal Project, Tank 106 was flushed and drained in 1996 (Section 3.3.9). Tank 106 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.1.4 Tank 107

Material stored in Tank 107 was considered a product for material in storage until April 20, 1994, when the RL determined there was no future use for the material and reclassified the material as mixed waste. Tank 107 was flushed and drained in 1996 as part of the HLV tank waste removal activity (refer to Section 3.3.9). Tank 107 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.2 Low-Level Vault

As part of the data quality objective process leading to the development of this closure plan, all parties agreed that the LLV/tanks could continue activity in support of the closure and decontamination activities. For this reason, the LLV was included within the closure boundary and would require closure actions after HLV and REC transfers were completed.

Tank contents were sampled and analyzed in June 1990 (refer to Chapter 4.0, Section 4.2 and Tables 4-1 through 4-7 for additional information). There are no documented occurrences of free liquids contained within the vault liner in the LLV area.

3.2.9.2.1 Tank 101

Tank 101 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.2.2 Tank 102

Tank 102 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.2.3 Tank 103

Tank 103 is currently empty. Tank 103 was used to receive radiological decontamination solutions from C-Cell and the airlock via the pipe trench. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.2.4 Tank 108

Tank 108 currently is empty. Information on sampling and analyses conducted on this tank can be found in Chapter 4.0, Section 4.3.

3.2.9.3 High-Level Vault Sample Room (Room 145)

Inside the sample room is a containment box that has vacuum sampling lines to the LLV tanks and HLV tanks. The room was last used in 1990 to sample all of the tanks. Vacuum sampling is not the preferred option for the HLV tanks because operations personnel are exposed to a significant radiation dose during sampling activities. Operational procedures governing HLV and LLV tank sampling require that spills be cleaned up immediately upon discovery before proceeding with the sampling procedure. There is no documentation or evidence of leaks from either the HLV or LLV sampling system.

3.2.9.4 324 Building Piping System

Piping connected to the vault tanks serves a variety of functions, including process liquid transfer, chemical addition, waste transfer, instrumentation access, tank venting and sparging, cooling water supply and return, and sampling. Information on the processes associated with the piping is given as part of the waste activity discussion for the REC (Section 3.1) and the HLV and LLV (Section 3.2).

3.3 WASTE REMOVAL ACTIVITIES

Before demonstration of closure of the 324 Building closure unit, some areas within the closure boundary require waste removal actions.

3.3.1 A-Cell

No closure activities are planned or required for A-Cell. However, as part of the building deactivation project, the FRG glass log storage rack and the electropolisher storage rack and related equipment will be removed and disposed as LLW.

3.3.2 B-Cell

B-Cell has had considerable equipment installed in the cell to support a variety of processing applications. Since 1988, a number of these items have been removed (Table 3.3). In 1995, RL and Ecology agreed to the M-89 milestones for mixed waste and process equipment removal (Milestone M-89-02, Ecology, et al., 1996).

The remaining equipment at that time consisted primarily of fuel storage equipment and three large equipment racks. The three large equipment racks (1A, 1B, and 2A) were used to support three in-cell process service tanks (Tank 112, Tank 114, and Tank 118), an evaporator tank (Tank 113), an acid fractionator tank (Tank 115), and associated ancillary equipment and piping. This equipment is shown in Figure 3-9. The in-cell process services tanks were sized to contain feed or condensate batches of about 1,000 liters each. The reverse-dish bottom provides the capability for near-emptying of the tanks by the numerous dip tubes located around the periphery of the tank. All tanks have one 25.4-centimeter removable flange at the center of the top head for insertion of an agitator or submerged pump. All tanks have a coil and/or jacket to supply up to 73.25 kilowatt/hour heating or cooling by either heat transfer area. Internal baffles are integral with the coils, thermal expansion provisions for the jackets were designed to 'wrap around' the lower head of the tank. Design pressures for the coils and jackets are 690 and 100 KPa, respectively.

All tanks are provided with ring-shaped air spargers; air purged dip tubes for measuring liquid level, specific gravity, and pressure; temperature elements in sealed walls; in-cell liquid samples; chemical addition pipes; piping for process transfers in and out of the tanks, and spare pipes to the manipulator-operator window areas of the cell. Additional details on tank construction are provided in the following paragraphs.

The 1A Rack (evaporation and acid recovery rack) is located along the east wall of the B-Cell. The 1A Rack contains an evaporator tank, Tank 113, a fractionator tank, Tank 115, and various associated piping, jumpers, condensers, towers, and support equipment. The overall dimensions of the rack support structure are 2.4 meters x 1.2 meters x 6.4 meters. There are four rack plugs associated with the 1A Rack, two upper airlock plugs (which are lead-shielded) and two lower pipe trench plugs. These plugs penetrate the east wall of the cell into the airlock and pipe trench, and provide piping services to the rack.

The thermosyphon-type waste evaporator (Tank 113) is constructed of all-welded A-55 titanium construction and the assembled system is 5.2 meters tall. Special features include a removable tube bundle, TB-113 in the reboiler, a deentraining sieve plate with bypass provisions in the tower, and an integral reflux condenser. The bottom reboiler section measures 36-centimeters diameter by 1.5-meters high. The midsection measures 1.2-meters diameter by 1.8-meters high. The tower section, with a removable glass fiber mist eliminator, measures 36-centimeters diameter by 2-meters high.

The all-titanium acid fractionator (Tank 115) consists of a packed tower distillation column surmounting a relatively standard reboil tank. The top and bottom spheroid heads are partially reinforced with an extra thickness of titanium plate for added strength, similar to those in the evaporator. The combined height of tank and tower is 6.4 meters, with the tower section measuring 0.43-meters diameter by 4.9-meters high and the tank measuring 1.2-meters diameter by 1.5-meters high.

The waste evaporator condenser (E-113) is made from titanium and nominally measures 0.3-meter diameter by 2.4-meters long, whereas, the fractionator condenser (E-115) is made from stainless steel because of the less severe corrosion conditions. The waste evaporator condenser has a condensing capacity of 530 liters/hour and the fractionator has a condensing capacity of 450 liters/hour.

The 1B Rack often is referred to as the feed system rack, as this houses two feed tanks and a reflux condenser. Similar to the 1A and 2A Racks, the 1B Rack is also on the east wall of B-Cell and has service piping that terminates in the airlock pipe trench. It is supported on the east wall by four wall plugs, nominally 30.5-centimeters diameter by 152-centimeters long. The upper wall plugs contain shielding lead and will be cut from the rack and disposed as mixed waste.

Each feed tank, tanks 112 and 114, has a capacity of 1,000 liters and is 1.1-meter in diameter and 1.5-meters tall. The tanks are fabricated from 304-L stainless steel and have a wall thickness of 0.95 centimeters. Tank 112 has a small horizontally mounted reflux condenser (E-112). Both tanks have stored highly radioactive solutions and are expected to be radiologically contaminated.

The 1B Rack is fabricated from 16.8-centimeters outer diameter by 0.34-centimeters (Schedule 10) stainless steel pipe and measures 0.9-meter x 1.8-meters x 5.2-meters. The calculated weight of the rack and components, assuming all components are empty, is about 3,946 kilograms.

The 2A Rack was installed as part of WSEP and contains the final off gas treatment equipment for the B-Cell processing system: a caustic scrubber, two off gas preheaters, and a fractionator condensate tank. Rack plugs hold the rack to the cell wall and serve as process pipeways. The 2A Rack is a 2.7-meters x 1.2-meters x 5.5-eters framework made of welded 16.8-entimeters outer diameter x 0.3-centimeter (Schedule 10) stainless steel piping and is attached to the cell wall by four wall plugs, which are nominally 1.8 meters long and 30.5 centimeters in diameter. About 35 nonradioactive services extend through each of the two upper plugs, and piping for up to 10 radioactive process streams runs through each of the two lower plugs. The upper plug piping terminates in the airlock, and the lower plug piping terminates in the pipe trench and is accessible from the airlock. The lower plugs do not contain lead shielding material.

The scrubber tank, Tank 118, has a 1,000-liter capacity and is 1.5 meters high by 1.1 meters in diameter. The 3.4-meters by 0.4-meter diameter tower (T-118) is packed with 2.5-centimeters Raschig rings and has a nominal capacity of 5,500 liters. The tower was designed to remove acids, radioruthenium, radioiodine, and aerosols from process off gasses. The recirculation pumping rate was controlled by a valve in a remotely removable pump-piping jumper and was measured by the liquid level above a weir at the pump discharge point near the top of the tower. An auxiliary reflux coil also was provided at the top of the tower. The 1,000-liter fractionator condensate tank (Tank 116) has the same dimensions as the scrubber tank. Both of these tanks must be size reduced to fit the disposal containers. The two stainless steel steam-heated exchangers mounted in the 2A Rack were used to heat the process gases to protect the subsequent absolute filters. Heater E-116 is in the primary process ventilation system and the other heater (E-118) is in the process vessel ventilation system. The steam was fed to E-116 heater and routed to the E-118 heater.

The BCCP was initiated in 1988 to address the radiological safety concerns from past R&D operations. The mission of the BCCP originally was to minimize radiological hazards associated with dispersible radioactive material within B-Cell. Subsequently, the BCCP has been modified to incorporate handling, packaging, and removal of dangerous waste stored within B-Cell.

3.3.3 C-Cell

C-Cell has been used to temporarily store (less than 90 days) mixed waste. C-Cell did not treat or store dangerous waste, except as a less-than-90-day storage area. Upon completion of waste treatability studies (currently planned to be completed by end of fiscal year 1999), the test equipment will be disassembled and removed.

3.3.4 D-Cell

Removal actions include removal of the waste mineral oil and absorbent stored in D-Cell (completed in January 1996) and the removal of the process equipment used for the processing of the HLV tanks liquid waste. This equipment currently is planned to be used for decontamination liquid waste processing during the closure of B-Cell and the deactivation of the 324 Building radiological areas.

3.3.5 Airlock

No waste removal activities are required for closure.

3.3.6 Pipe Trench

Piping that connects HLV tanks to equipment racks in B-Cell must be removed to facilitate removal of the equipment racks from B-Cell. The piping has been rinsed and flushed as part of the HLV tank waste removal project. Additionally, determination of the waste designation for sludge present in the pipe trench cannot be completed until samples of the sludge are obtained. If the sludge designates as mixed waste, closure activities will include collection of the sludge for storage or disposal at an appropriate TSD unit.

3.3.7 Other 324 Building Areas

Because EDL-146, cask handling area, trucklock, and galleries were not used to treat or store dangerous waste, except as a less-than-90-day storage area and satellite accumulation area, waste removal activities will not be performed. Current planning includes removal and/or isolation of the piping between these areas and the vault tanks

3.3.8 Other Components

Other areas of concern to the closure are the pass-through ports and the cubicles. These components were not used to treat or store dangerous waste, so no waste removal activities will be performed on these areas.

3.3.9 High-Level Vault Waste Removal Activities

To comply with Tri-Party Agreement Milestone M-89-01, liquid waste stored in the HLV tanks was removed and the HLV tanks were rinsed and flushed in September 1996. Additional closure activities are in Chapter 7.0, Section 7.2. Briefly, the waste in the HLV tanks was transferred to Tank 104 in the HLV. From Tank 104, the waste was steam jetted to Tank 112 in B-Cell, and vacuum transferred to the waste treatment system in D-Cell. The solutions were chemically adjusted to precipitate the heavy metals present; the precipitates were collected on enclosed filters. The supernate from the filtration process was again chemically treated by addition of calcium carbonate; this precipitated the strontium-90 present in the supernate. The precipitate was collected for use in the medical isotope program (RL 1997). The supernate from this process was passed through an ion exchange column to collect the cesium-137. The remaining low-level liquid was transferred to the 340 Building for subsequent transfer to the DST System.

The HLV tanks were triple rinsed; the rinse solutions were jetted through each tank and transferred to D-Cell for treatment. The first two rinses were dilute nitric acid, the third was a dilute carbonate rinse. Information on sampling and analyses conducted on the HLV tank contents can be found in Chapter 4.0.

3.3.10 Low-Level Vault Waste Removal Activities

All of the LLV tanks currently are empty.

3.3.11 Piping Removal Activities

That portion of the piping that connects the HLV tanks to equipment racks in B-Cell and that runs through the pipe trench must be removed to proceed with equipment rack removal activities in B-Cell. Piping in B-Cell equipment racks also will be removed during demolition of the equipment racks. The piping will be rinsed and appropriately disposed. Details on closure activities for all other piping within the closure area can be found in Chapter 7.0.

This page intentionally left blank.

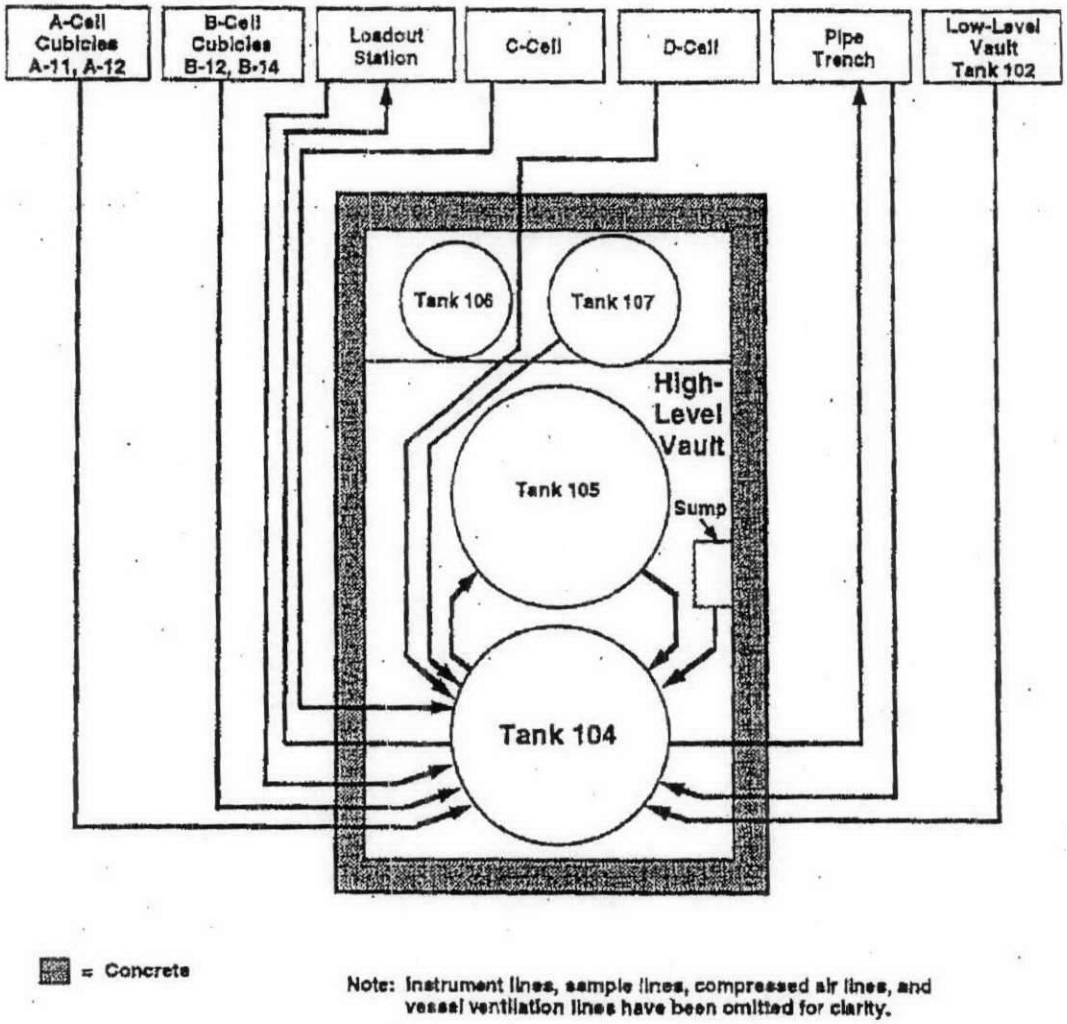
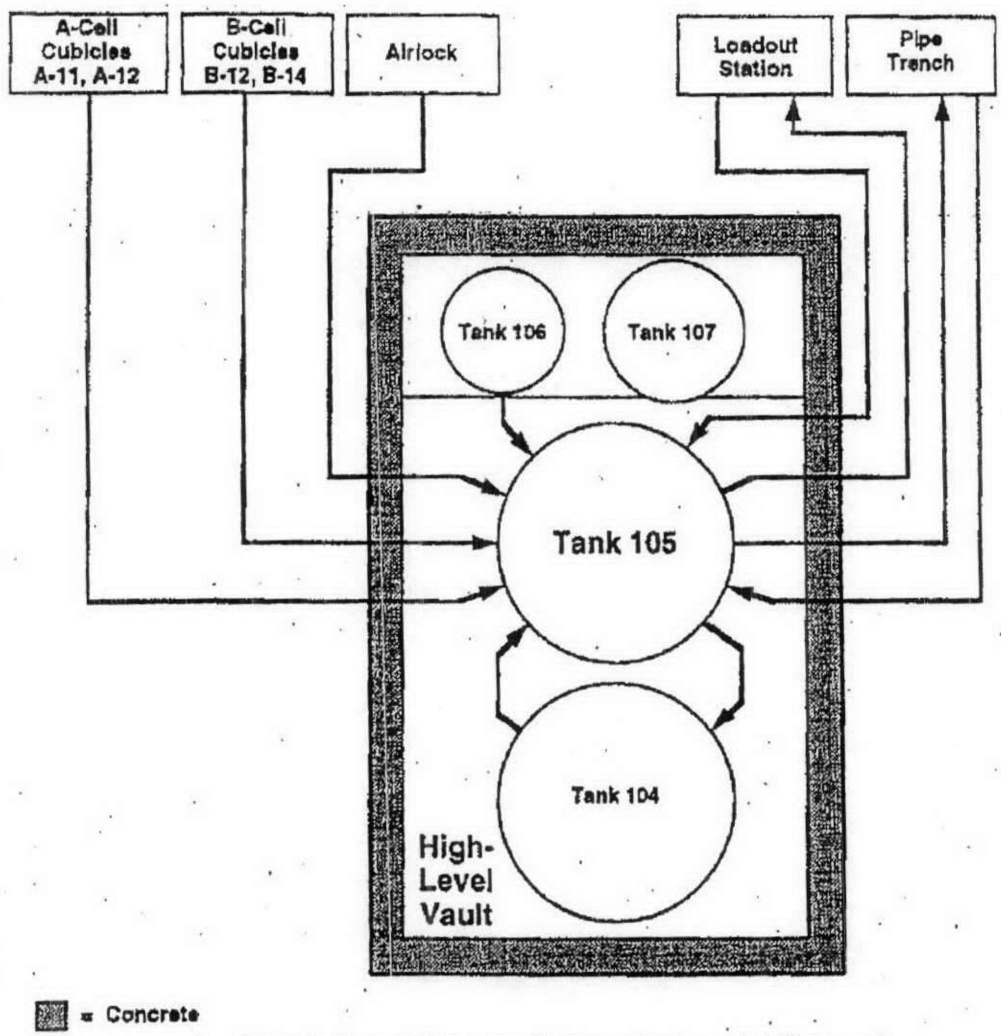


Figure 3-1. Schematic of the 324 Building High-Level Vault Process Piping for Tank 104.



Note: Instrument lines, sample lines, compressed air lines, and vessel ventilation lines have been omitted for clarity.

Figure 3-2. Schematic of the 324 Building High-Level Vault Process Piping for Tank 105.

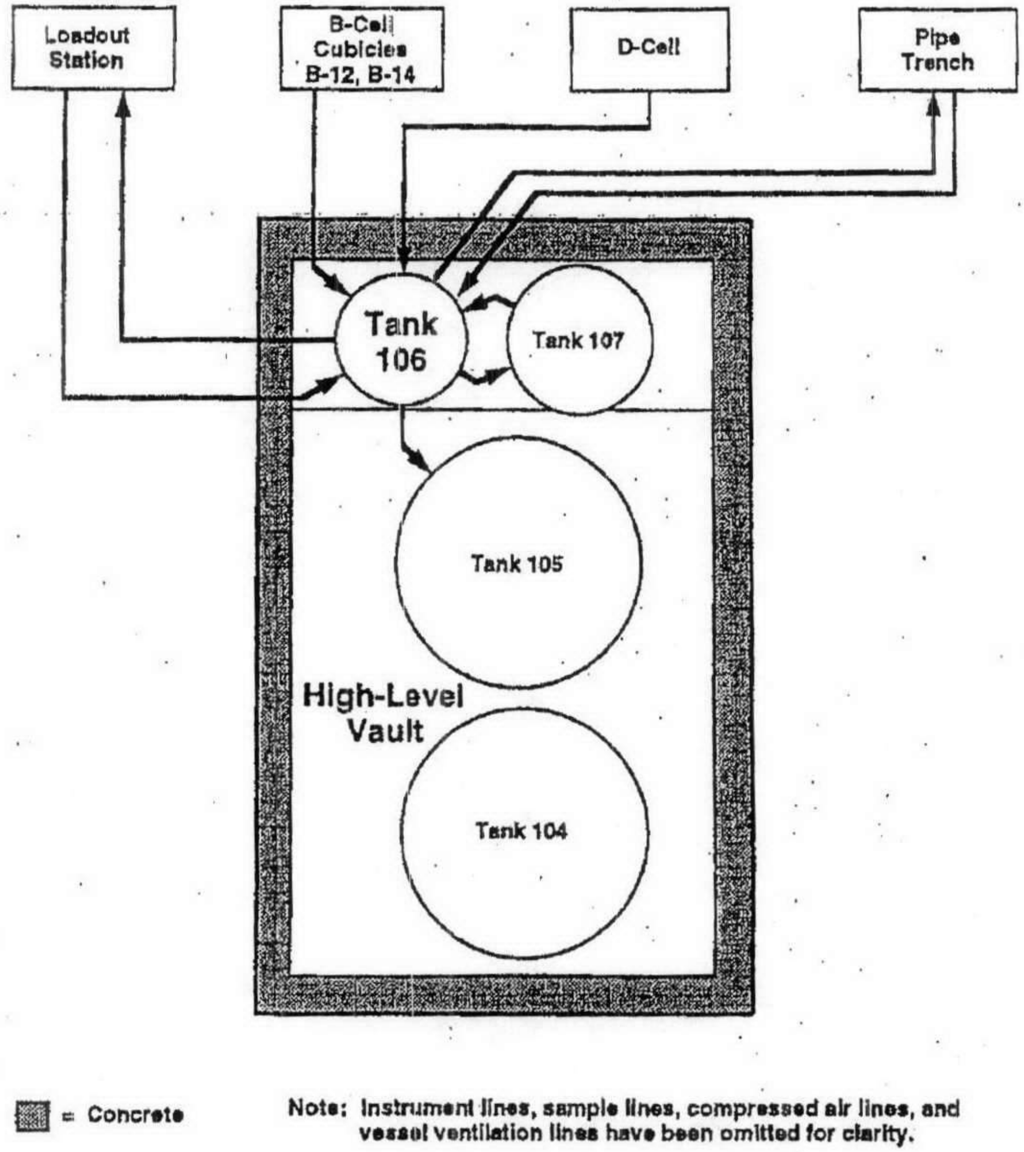


Figure 3-3. Schematic of the 324 Building High-Level Vault Process Piping for Tank 106.

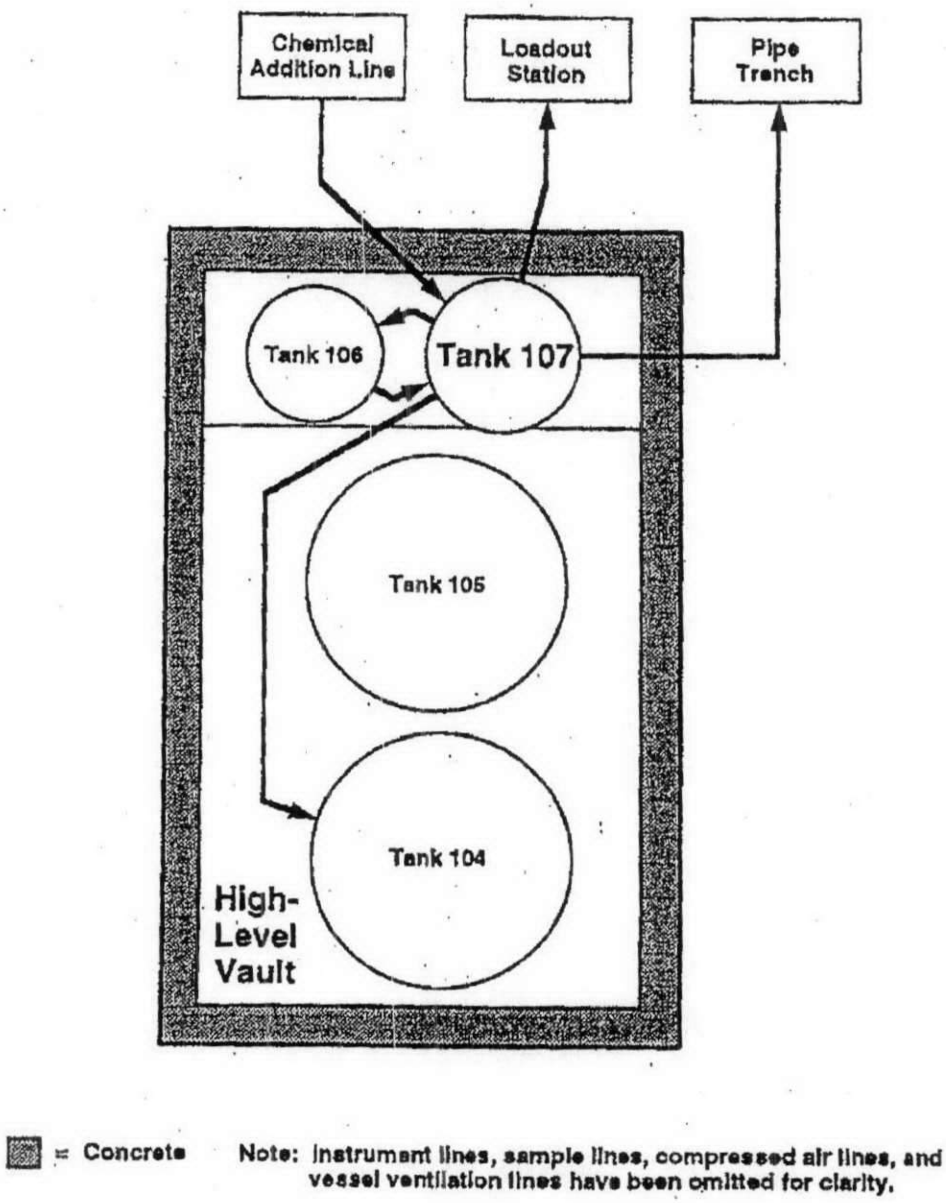


Figure 3-4. Schematic of the 324 Building High-Level Vault Process Piping for Tank 107.

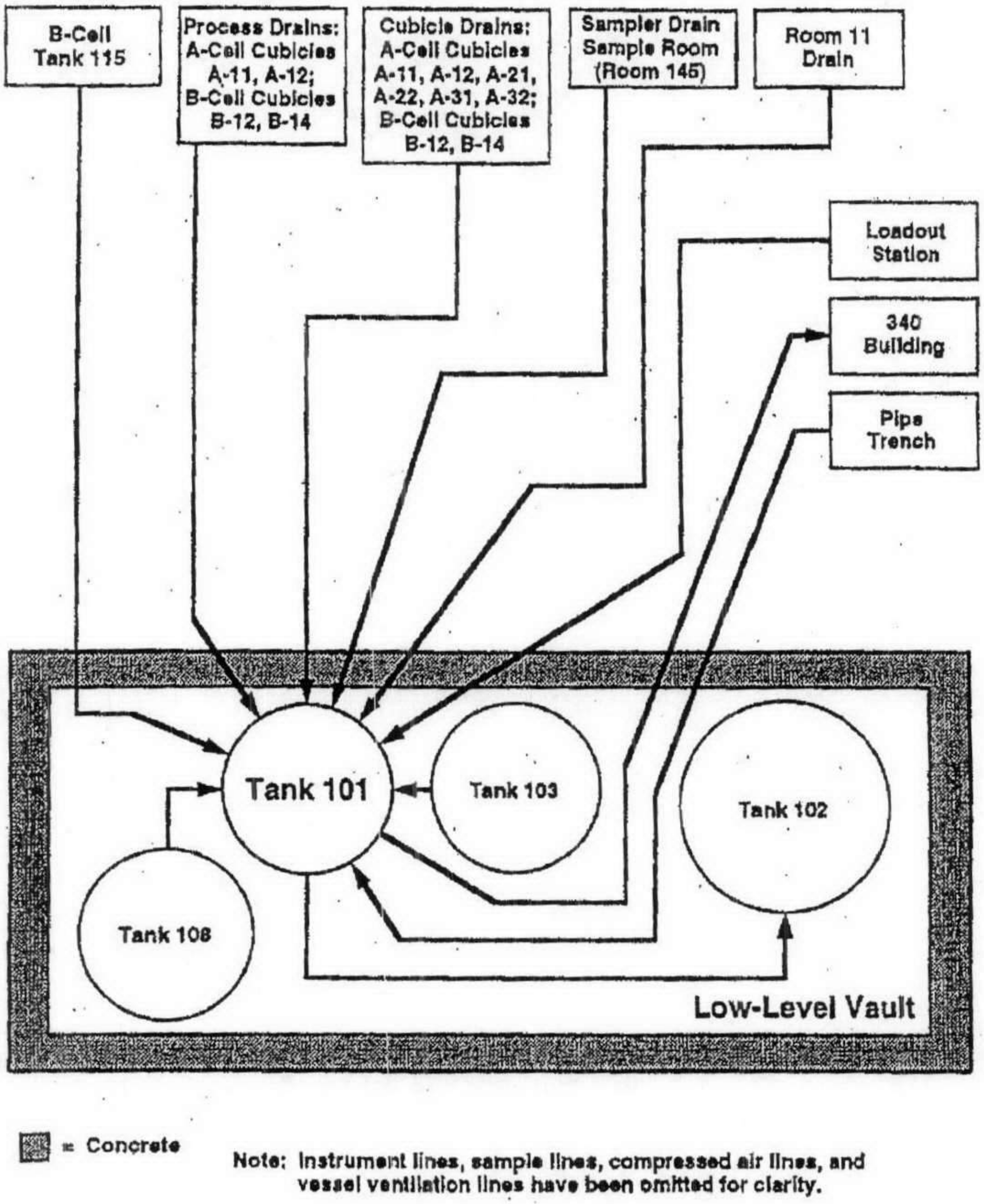
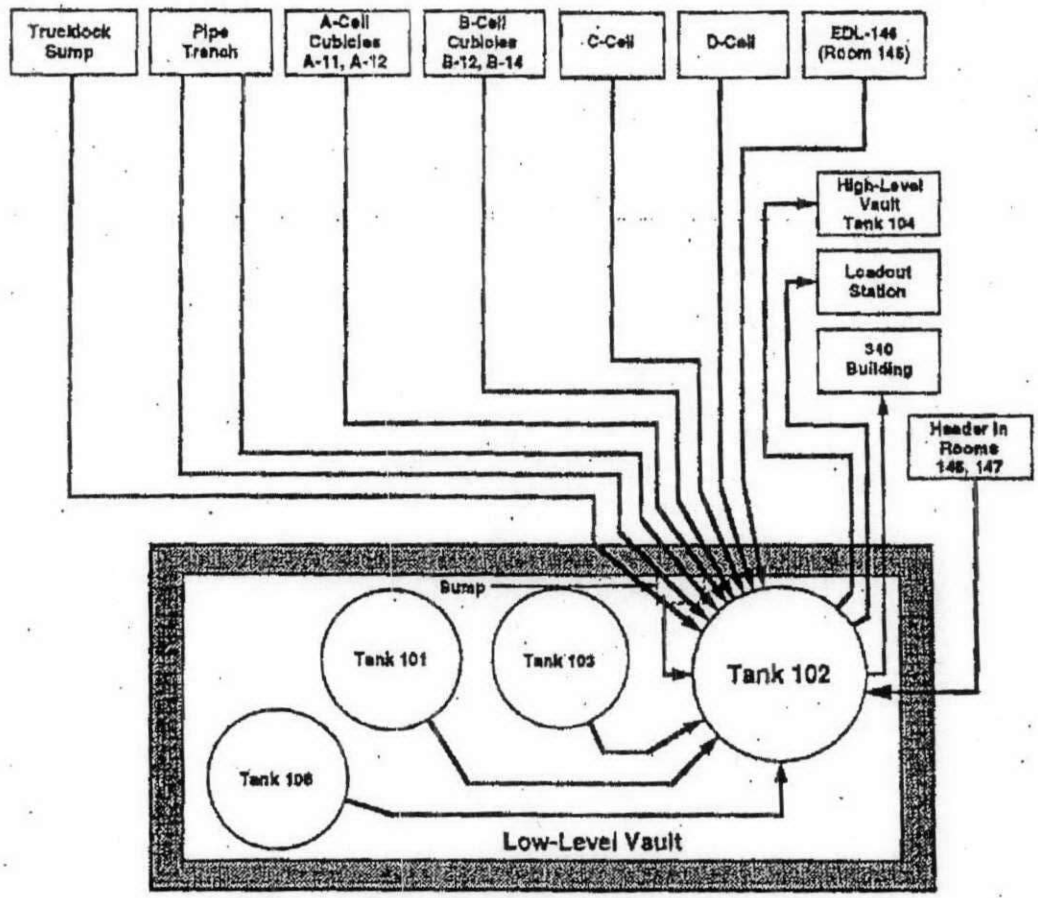


Figure 3-5. Schematic of the 324 Building Low-Level Vault Process Piping for Tank 101.



EDL = Engineering Development Laboratory
= Concrete

Note: Instrument lines, sample lines, compressed air lines, and vessel ventilation lines have been omitted for clarity.

Figure 3-6. Schematic of the 324 Building Low-Level Vault Process Piping for Tank 102.

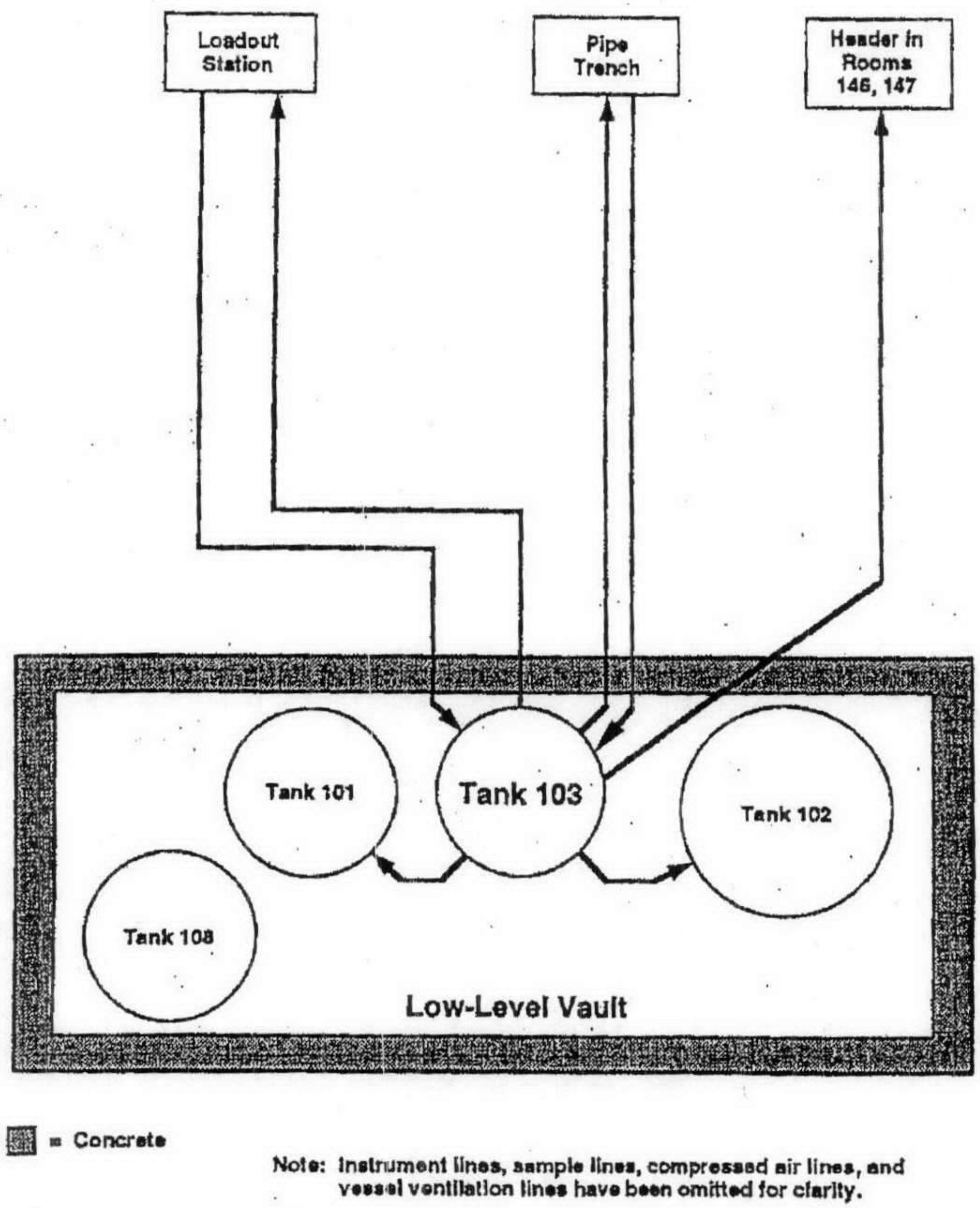


Figure 3-7. Schematic of the 324 Building Low-Level Vault Process Piping for Tank 103.

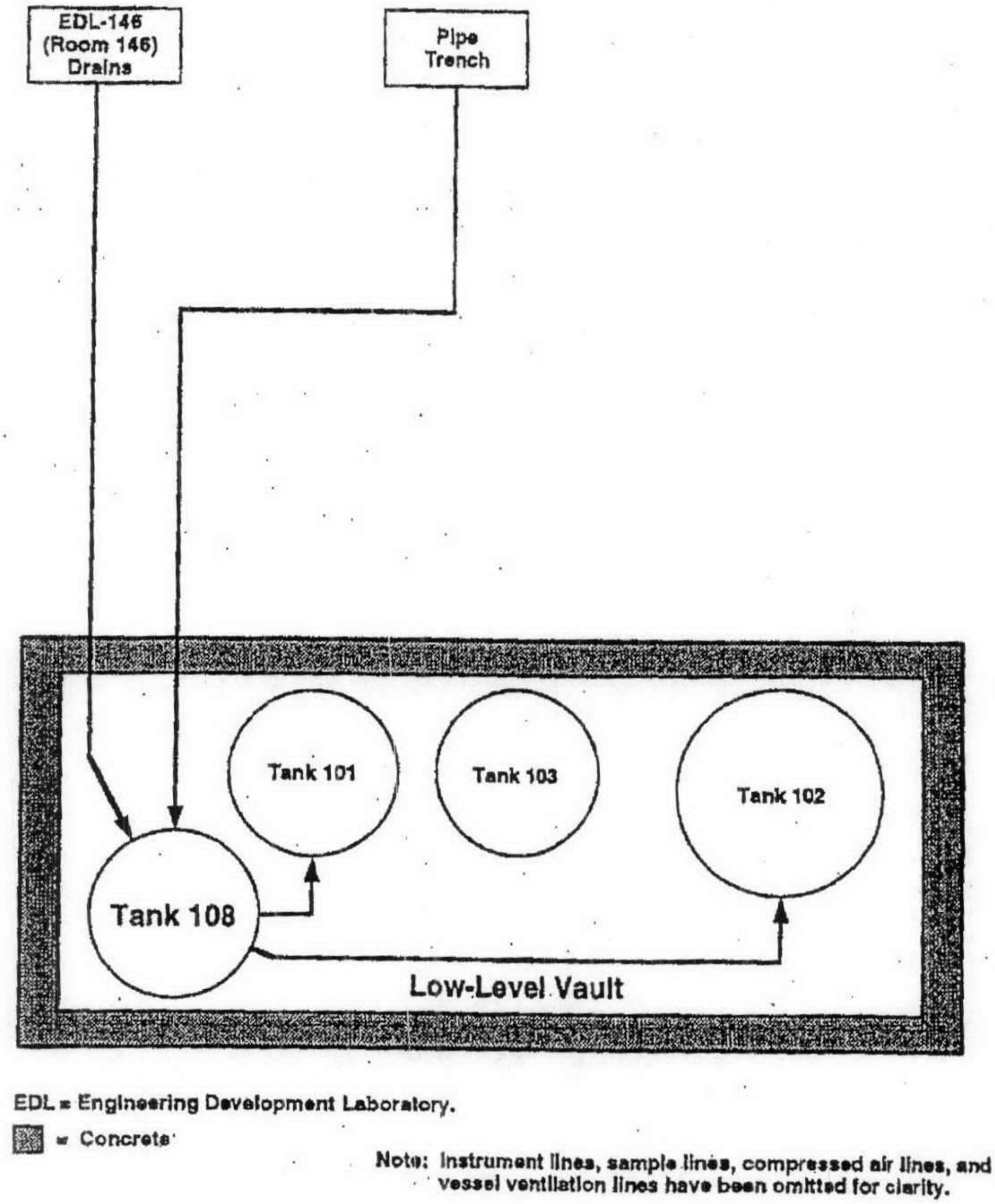


Figure 3-8. Schematic of the 324 Building Low-Level Vault Process Piping for Tank 108.

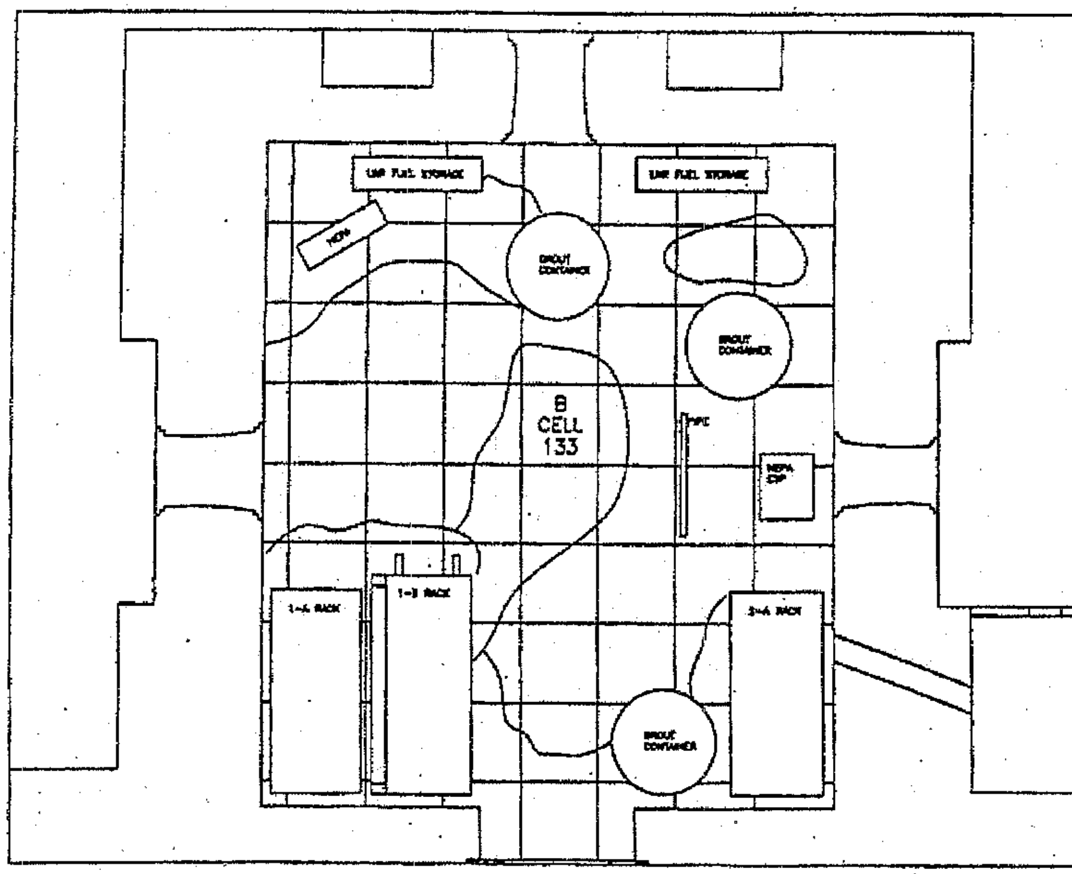


Figure 3-9. B-Cell Racks.

This page intentionally left blank.

Table 3-1. Chronology of B-Cell Activities.

Activity	Dates
Waste Solidification Engineering Prototype Program (WSEP)	1966-1972
No Activity*	1972-1976
Nuclear Waste Vitrification Project (NWVP)	1976-1979
No Activity*	1979-1981
Zeolite Vitrification Demonstration Project (ZVP)	1981
Pilot-scale Radioactive Liquid-Fed Ceramic Melter (RLFCM) testing task (includes cell prep and installation of RLFCM equipment)	1982-1986
Federal Republic of Germany (FRG) Program (production of isotopic heat sources)	1986-1987
No Activity*	1987-1988
B-Cell Cleanout	1988-present.

*Periods listed as 'no activity' indicate that no project or R&D activities were occurring in the cell during that time.

Table 3-2. Summary of Major B-Cell Equipment Items.

FY	Rack	Major equipment in rack	Cleanout status[1]	Total m^3	Approximate dimensions in m (ft)	Construction materials	Equipment use
1990		Disassembly table	R	8.15	2.4 x 0.9 x 3.7 8 x 3' x 12'	SS	Support and placement of fuel assemblies for shearing operations
		Dissolver (Tank 127)	R	.22	3.0 x 0.3 OD 10' x 1' OD	SS	Dissolution of chopped PWR spent fuel
		Auxiliary dissolver reservoir	R	.22	3.0 x 0.3 OD 10' x 1' OD	SS	Reservoir for dissolver solution
		Condenser	R	.22	3.0 x 0.3 OD 10' x 1' OD	SS	Off gas treatment
		Containment vessel	R	3.50	3.0 x 1.2 OD 10' x 4' OD	SS	Liquid solution secondary containment
1990	7C	--	R	1.3	1.2 x 0.3 x 3.7 4' x 1' x 12'	SS	Equipment service rack
1991	4C	--	R	2.0	2.1 x 0.3 x 0.3 7' x 1' x 10'	SS	Equipment service rack
1991		Acid holding tank (Tank 125)	R	.35	1.2 x 0.6 4' x 2' OD	SS	PWR hull acid soak tank
		Solution storage (Tank 126)	R	.35	1.2 x 0.6 4' x 2' OD	SS	Dissolver solution storage (up to 300 g/L U)
1991		Hull rinse tanks (tanks 128 and 129)	R	.17	2.4 x 0.3 8' x 1' OD (each)	SS	Washing of PWR hulls after shearing
1992	5A	Induction-heated furnace	R	11.3	3.0 x 1.2 3.0 10' x 4' x 10'	SS	NWVP in-can induction furnace
1992	3C	--	R	2	2.1 x 0.3 x 3.0 7' x 1' x 10'	SS	Support structure
		Packed scrubber (Tank 111)	R	.19	2.7 x 0.3 9' x 1' OD	SS	Off gas treatment
		Condenser (E-119)	R	.19	1.8 x 0.3 6' x 1' OD	SS	Off gas treatment
1993	3A	--	R	13.4	2.4 x 1.1 x 5.2 8' x 3-1/2' x 17'	SS	Support structure
		Venturi scrubber	R	.02	1.2 x 0.030 OD 4' x 1' OD	Inconel	Primary RLFCM off gas treatment
		Scrub solution storage tank (Tank 134)	R	2.5	0.9 x 1.5 x 1.8 3' x 5' x 6'	Inconel Hastelloy	Venturi scrub solution recirculation tank

Table 3-2. Summary of Major B-Cell Equipment Items.

FY	Rack	Major equipment in rack	Cleanout status[1]	Total m^3	Approximate dimensions in m (ft)	Construction materials	Equipment use
1993	3B	--	R	10.8	2.4 x 0.9 x4.9 8' x 3' x 16'	SS	Support structure
		Waste feed tanks (tanks 130 and 131)	R	3.2	2.4 x 0.9 8' x 3' OD (each)	SS	Preparation and storage of RLFCM feeds (cesium and strontium solutions to $3.7x10^{13}$ Bg/L)
		Hydraulic pulser (A-130)	R	.33	2.4 x 0.5 8' x 1-1/2' OD	SS	Feed tank agitation
		Seal pot (Tank 135)	R	.08	1.2 x 0.3 4' x 1' OD	Inconel Hastelloy	RLFCM pressure relief
1994	4A	--	R	8.1	2.4 x 1.2 x 2.7 8' x 4' x 9'	SS	Support structure
		Canister storage (Tank 120	R	.76	2.4 x 1.2 x 2.7 8' x 4' x 9'	SS	Storage of waste canisters currently unacceptable for burial
1994	6A	RLFCM containment vessel	R	4.7	2.1 x 1.8 x 1.2 7' x 6' x 4'	SS. Inconel, various types of ceramic insulating bricks	Liquid-fed ceramic, melter tank (cesium and strontium glass up to 55.5 Bg/g)
		Turntable	R	7.2	2.7 x 1.8 9' x 6' OD	SS	RLFCM canister containment and positioning
		Glass-level detection system source positioner	R	.47	3.7 x 0.3 12' x 1' OD	SS	Measurement of glass level in RLFCM canisters
Miscellaneous							
Sep/Oct 1996	7B	Fuel storage rack	R	9.9	2.1 x 1.5 x 3.0 7' x 5' x 10'	SS	Spent fuel storage
		Weld/rinse station	R	.54 2.0	3.4 x 0.5 11' x 1-1/2' OD 2.4 x 0.9 0.9 8' x 3' x 3' (support stand)	SS	Preliminary decontamination of RLFCM/FRG canisters and weld closure
		FRG canister storage pods	R	6.0 .64	0.9 x 0.9 x1.2 3' x 3' x 4' (6) 1.2 x 0.3 4' x 1' OD (8)	SS	Temporary storage for FRG canisters
		FRG instrumented canister furnace	R	.35	1.2 x 0.6 4' x 2' OD	SS	Annealing furnace for FRG glass cracking tests
		Failed pumps/agitators	R	2.1	2.4 x 0.6 8' x 2' OD (3)	SS	Various process vessels

Table 3-2. Summary of Major B-Cell Equipment Items.

FY	Rack	Major equipment in rack	Cleanout status[1]	Total m^3	Approximate dimensions in m (ft)	Construction materials	Equipment use
		Miscellaneous equipment	PR		Varies	SS primarily	Various equipment dropped to floor over 20-year period
1998	1B	--		14	2.4 x 1.2 x 4.9	SS	Support structure
		Storage tanks (tanks 112 and 114)		2.6	1.5 x 1.1 OD each	SS	Storage of cerium, cesium, strontium, and dissolver waste solutions 1 (up to 3.7x10^{13} Bg/L)
1998		Containment vessel (Tank 119)		4.2	3.7 x 1.2 12' x 4' OD	SS	Secondary liquid containment for tanks 125 and 126)
1998	2A	--		18	2.7 x 1.2 x 5.5	SS	Support structure
		Condensate collection (Tank 116)		1.3	1.5 x 1.1 5' x 3-1/2' OD	SS	Final off gas condensate collection (low-level liquid waste)
		Heater (E-116)		0.08	1.2 x 0.3 4' x 1' OD	SS	Off gas heater for filter protection
		Filter assemblies (F-111, F-112, F-113)		.67	0.3 x 0.6 x 1.2 1' x 2' x 4' (each)	SS	HEPA filter enclosure assemblies
		Final scrubber (Tank 118) and Tower (T-118)		1.3 2.6	3.7 x 0.3 OD (T-118) 5' x 3-1/2' OD (TK-118)	SS	Final off gas treatment (low-level liquid waste)
1999	1A	--		19	2.4 x 1.2 x 6.4	Stainless steel (SS)	Support structure
		Evaporator (Tank 113)		1.7	3.0 x 1.2 OD	Titanium	Waste concentrator, preparation of cerium, cesium, strontium, and dissolver solution waste (up to 3.7x10^{13} Bg/L)
		Evaporator tower (T-113)		0.15	2.1 x 0.30 OD 2.1 x 0.3 7' x 1' OD (T-113)	Titanium	Tower for evaporator
		Evaporator condenser (E-113)		0.18	2.7 x 0.6 OD	Titanium	Off gas treatment
		Fractionator (Tank 115)		1.7	1.5 x 1.2 OD	Titanium	Acid collection and concentration
		Fractionator and tower (T-115)		0.63	4.9 x 0.3 OD	Titanium	Tower for fractionation

Table 3-2. Summary of Major B-Cell Equipment Items.

FY	Rack	Major equipment in rack	Cleanout status[1]	Total m^3	Approximate dimensions in m (ft)	Construction materials	Equipment use
		Fractionator condenser (E-115)		.24	2.4 x 0.6 OD	SS	Off gas treatment

SS = stainless steel OD = outside dimension [1]R designates equipment removed PR designates equipment partially removed.

This page intentionally left blank.

CONTENTS

TABLES

This page intentionally left blank.

4.0 WASTE CHARACTERISTICS

This chapter describes the quantities and characteristics of the waste stored in the REC, HLV, and LLV. The description of the waste characteristics is based on an evaluation of process records, process knowledge, and available waste analyses data. The quantities of waste are the estimated volumes that existed before inventory removal. The information is summarized in Tables 4-1 and 4-2.

The process used to gather the information included discussions with knowledgeable building personnel and research of historical documentation (e.g., process records). Wherever gaps in information were identified, knowledgeable personnel were asked to provide any historical information, documentation, or information that would provide insight to chemicals or feedstocks used during past operations.

Chemical analysis of the material was not always amenable to the use of specific SW-846 (WAC-173-303-110) methods because of as low as reasonably achievable (ALARA) concerns with respect to radiation exposure. Because of the safety constraints and the limitations of technology available for remote sampling and analysis, a comprehensive analytical waste characterization was not conducted.

4.1 B-CELL PROCESSES FEEDSTOCK COMPOSITIONS

The waste material in the REC and the HLV and LLV tanks came primarily from the processes performed in B-Cell. This section summarizes the information available on the feedstocks used in those processes. For some processes, searches for historical documentation provided little specific information.

4.1.1 Waste Solidification Engineering Prototypes Program

The WSEP Program (Chapter 3.0, Section 3.1.2.1) was active from 1966 through 1972. The program was used to demonstrate three methods of solidifying radioactive high-level waste (HLW). These methods were pot solidification, spray solidification, and phosphate glass formation. A description of these processes is provided in Chapter 3.0. The feed material compositions used in the WSEP program represented high-level waste from aqueous reprocessing plants.

The WSEP studies involved formulating study glasses; about 1,500 melts using different ratios of added inert chemicals, different waste-to-frit ratios, and different radioisotopic loadings. Table 4-3 lists several typical feedstock compositions tested. The information presented is compiled from quarterly progress reports for the Atomic Energy Commission Research and Development, 1965-1967 (e.g., BNWL-1186). All of the feed formulated during this program was mixed with silica frit to form the glass (EPRI-NP-44-SR).

4.1.2 Nuclear Waste Vitrification Project

The NWVP process vitrified liquid high-level waste produced during demonstration of separation of fissile materials from commercial spent nuclear fuel. Initially, the plutonium and uranium were extracted at the 325 Building. The remaining liquid HLW solution was returned to 324 Building and vitrified in B-Cell. Two glass-producing runs were made. The liquid HLW was used to formulate a feed stock using the PW-8a composition (Table 4-3). The liquid HLW was dried at high temperatures to form a granular powder (calcine). The frit-to-calcine ratio used in the program was 4.2:1 and 2.2:1, respectively, for the two glass-making runs performed (EPRI-NP-44-SR and PNL-3038).

Some liquid HLW solution not used in production of glass was retained in HLV Tank 107 for future use. The material in Tank 107 was included in the solutions treated during the HLV Interim Waste Removal Action Project (Chapter 3.0, Section 3.3.9).

4.1.3 Zeolite Vitrification Demonstration Project

The ZVDP was used to demonstrate that zeolite ion exchange resins could be vitrified to immobilize radionuclides present in the resin. The zeolite used in this vitrification process was Linde Ionsiv IE-95®, which consists of a matrix of polystyrene with a nuclear sulfonic acid active group. Approximately 0.45-square-meters of zeolite containing radioactive cesium and strontium was used for the demonstration. The feed formulation used to produce the glass canisters was 5% B_2O_3, 5% Li_20, 8% Na_2O, 7% TiO_2, and 75% zeolite (PNL 1981).

4.1.4 Radioactive Liquid-Fed Ceramic Melter Testing

The RLFCM program used feed slurries containing all glass formers and waste in a single nitric acid solution that was fed to the melter. Feed stocks for the slurries were separated into two separate categories: (1) cold (nonradioactive) feed stocks and (2) radioactive feed stocks. Cold feedstocks were used to test the operation of the melter system. The cold feedstocks were identical to radioactive feedstocks except that nonradioactive metals were substituted for the radioisotopes. Table 4-4 lists the composition of radioactive and nonradioactive feedstocks.

Feedstock solutions used during the production of sealed isotopic heat sources for the FRG Program were kept separated in HLV Tanks-104 and -105. Tank 104 was used to hold high cesium-137 concentration feedstocks, and Tank 105 held high strontium-90 feedstocks. Table 4-5 lists the chemical composition of these two waste types used during the FRG Program.

4.2 RADIOCHEMICAL ENGINEERING CELLS WASTE INVENTORY AND CHARACTERISTICS

Mixed-waste generation and storage occurred in B-Cell and D-Cell. B-Cell waste was generated as a result of performing pilot-scale waste treatability studies. D-Cell was used to temporarily store and treat mixed waste. Waste generated in B-Cell is primarily found enclosed in process equipment and as a component of dispersible material present on the floor due to unplanned releases of process solutions into the cell. One container of mixed waste was generated by collecting mineral oil absorbed on diatomaceous earth when a shielded window in B-Cell failed. The container was transferred to D-Cell for temporary storage to decrease the amount of flammable combustibles in B-Cell. That container was removed and transported as SCW to the PUREX Storage Tunnels in January 1996. D-Cell also was used to house the HLV Interim Waste Removal Action equipment that was used to treat waste from the HLV. This equipment continues to be stored in the D-Cell.

The dangerous waste components of mixed waste in B-Cell were introduced primarily during testing of vitrification technologies as described in Chapter 3.0. Chemical solutions used for in-cell processes were nitric acid based, resulting in solutions with pH readings less than 1. Radioactive solutions high in strontium-90 and cesium-137 transported to the building from the B-Plant complex in 1985 contained trace amounts of heavy metals such as chromium and lead. Additionally, elemental lead was used in B-Cell both for radiation shielding and as counterbalance weights on equipment. Subsequent size reduction by cutting of equipment containing this shielding or counterbalance material generated small particles of elemental lead that eventually mixed with dispersible materials on the cell floor.

From a review of analytical data and process and operating records, and a comparison with the designation criteria of WAC 173-303, the following waste streams in the REC have been designated as mixed waste:

- Dispersible material and debris contaminated with spilled feed material
- Elemental lead
- Dried melter feed heels
- Liquid metal seal
- Window oil and oil absorption material
- Filters containing heavy metals.

These classifications are described further in the following sections. Table 4-1 provides a list of the dangerous waste in B-Cell and D-Cell, the dangerous waste numbers, and an estimate of maximum inventory.

4.2.1 Dispersible Material and Debris

Dispersible material and debris, located in B-Cell, consists of dirt, dust, process residues, and equipment and tools that collected on the floor during operations. Additionally, the dispersible material includes 'one-time' or sporadically-spilled feed material that contained heavy metals and radionuclides from B-Cell process equipment. The dangerous waste constituents present are cadmium, chromium, and lead.

In 1986, an estimated 750 liters of a nitric acid solution containing cesium-137, strontium-90, and trace amounts of plutonium and heavy metals (chromium and lead) were accidentally released to the southeastern portion of the floor in B-Cell during RLFCM operations. It is known, however, that a thick layer of fine dirt particles introduced through the ventilation inlets during the life of the building was present on the cell floor. Additionally, some equipment and tools dropped during operations, such as wrenches, air hoses, thermocouple wires, small tools, pieces of manipulator boots, air hoses, water hoses, pieces of pipe, and glass sample vials, also were present in the spill area. It is assumed that some quantity of the spilled liquid was absorbed by the material on the floor, or coated larger items present. It is also assumed that the liquid eventually evaporated, leaving a crusty, dried mud-like material that, if disturbed, breaks into finely dispersible particles ranging in size from macro to very fine (size distribution undetermined) material.

The location of equipment racks over the spill area has precluded cleanup or sampling of the floor in the location of the spill. Additionally, an equipment rack is positioned over the cell sump. Until the equipment racks in the eastern half of the cell are removed, access to the spill area or the sump area is not possible. It has been estimated, based on the Facility Radioactive Material Log, maintained in the 324 Building, that the dispersible material within B-Cell contains about 1.5 million curies of radioactive materials, primarily cesium and strontium isotopes.

Material in B-Cell currently is being collected for removal as part of the BCCP (Chapter 3.0, Section 3.2.2). To date, 10 containers of dispersible material have been collected and characterized. These engineered containers (EC) were labeled as EC-14, EC-15, EC-16, EC-17, EC -19, EC-21, EC-22, EC-23, EC-24, and EC-25. After collecting the dispersible material from the floor, the material was run through a sieve to remove the larger debris. The sieved material was loaded into steel containers. Once the material was placed in containers, the containers were moved to a work station in front of a cell window. A sample from each container was obtained by coring. A sample auger of sufficient length to collect sample from the top to the bottom of the container was forced through the material in the container. The sample auger was unloaded into an engineered storage container; approximately five grams of material was removed from this container as a sample for analysis. These samples were collected in 1995 and were transported to the PNNL 325 laboratory for analyses. The analytical data is summarized in Table 4-6.

A pH analysis was performed on samples from all the containers. The pH analysis was performed by leaching 0.5 gram of sample with five grams of water for 15 minutes. Duplicate samples were run for each container. The pH of the leachate solutions ranged from 8.0 to 8.8.

Approximately five grams of each sample were analyzed using the toxicity characteristics leaching procedure (TCLP) for designation purposes. All samples were extracted using a 20 times dilution. The extract from the TCLP was diluted 1.25 fold and analyzed using inductively coupled plasma (ICP) spectroscopy. The analysis included the use of duplicate samples, preparation blanks, and TCLP extract blanks. Table 4-6 provides the analytical results.

The analyzed quality control samples were within acceptable limits. Sample spike recoveries for all analyses were within acceptable limits except for silver, which was low (ranging from 32 percent to approximately 50 percent). The laboratory control standards also showed low silver recoveries. However, it is noted that for the samples, there is no silver detected above the instrument detection limit, which is 200 times below the regulatory threshold. Also, the small sample size might add additional uncertainty to the values.

PNNL designated the dispersible material in B-Cell in 1995 based on these analytical results. Process knowledge was used to determine that the dispersible waste was not generated from a discarded chemical product, or a listed waste source. The dispersible material was not an 'unused chemical product.' B-Cell had been used to demonstrate engineering scale radioactive processes. These processes did not include the use of any 'listed' materials. The dispersible material was designated based on comparison of the analytical results with toxic characterist regulatory limits (WAC 173-303-90). Based on the analytical results, the despersible material was designated as a characteristic waste for cadium (D006), lead (D008), and chromium (D007) and as extremely hazardous waste (WT01). The pH analyses indicated that the despersible material did not show the characteristic of corrosivity.

The dispersible material collected through May 1996 was transferred in 1996 to the PUREX Storage Tunnels for long-term storage. As more material is collected and designated as mixed waste, this waste will be transferred to an onsite TSD unit or shipped offsite to a TSD facility.

4.2.2 Elemental Lead

Approximately 0.7 cubic meter of lead that was used as shielding or counterbalance weight in B-Cell and 0.09 cubic meter of lead shot have been stored in B-Cell. Lead that was poured into the legs of equipment for stability is being removed from B-Cell with the equipment as part of the BCCP. The radioactive contaminated elemental lead that had been collected through May 1996, which was remote-handled mixed waste, was transferred in July 1996 to the PUREX Storage Tunnels in 1996 for long-term storage

PNNL designated the elemental lead in 1994 based on process knowledge. As recorded in a memo to file, the lead was not generated from a discarded chemical product or a listed waste source. It was assumed that the elemental lead would leach during a TCLP in levels in excess of the regulatory levels. This generator knowledge was used to designate the elemental lead waste as characteristic for lead (D008) and as extremely hazardous waste (WT01).

4.2.3 Dried Melter Feed Heels

Small process feed tanks located in B-Cell were used during the FRG Program melter testing project and other pilot process operations. The feed solution in the tanks dried up, leaving a highly radioactive and potentially mixed waste. This dried material is referred to as dried melter feed. During previous cleanup activities in B-Cell, approximately 0.17 cubic meter of this material was removed from the tanks and placed in 11-liter steel-tube containers. This material was transferred in February 1996 to the PUREX Storage Tunnels in 1996 for long-term storage.

PNNL designated the dried melter feed heels in 1994 based on process knowledge and analytical results of the original feed material. As recorded in a memo to file, the dried melter feed heels did not meet the criteria for listed waste. The analytical data available for the original feed material used for designation indicated lead and chromium concentrations of 2.36 grams/liter and 1.72 grams/liter respectively. This information was used to calculate that the concentration in the dried feed material would be approximately 5,200 parts per million lead and 3,800 parts per million chromium. The TCLP used to designate waste requires a 20:1 dilution during the extraction process. If it is assumed that all of the metal contamination was leachable, the maximum concentration in the extract would be 260 parts per million lead and 190 parts per million chromium. Therefore, the dried melter feed heels were designated as characteristic for lead (D008), and chromium (D-007), and as extremely hazardous waste (WT01).

4.2.4 Liquid Metal Seal

The liquid metal seal is a metal alloy containing 50 percent bismuth, 26.7 percent lead, 13.3 percent tin, and 10 percent cadmium. This alloy has a melting point of 70°C, and it was used as a seal material as part of the glass melter (refer to Chapter 3.0, Section 3.2). The waste as packaged was <0.2 cubic meter in volume, and was transferred in 1996 to the PUREX Storage Tunnels.

PNNL designated the liquid metal seal in 1994 based on process knowledge and analytical information available on the original material. The liquid metal did not meet the criteria for listed waste. The metal seal is assumed to be an alloy composed of bismuth, lead, tin, and cadmium in the concentrations noted previously. The exact product information could not be located; this composition was based on melting point data. It was assumed that the elements would leach during a TCLP in excess of the regulatory limits. Generator knowledge was used to designated the liquid metal seal waste as characteristic for lead (D008), and cadmium (D006), and as extremely hazardous waste (WT01).

4.2.5 Window Oil and Oil-Absorption Material

An absorbent material (diatomaceous earth) was used to clean up mineral oil from a leaking window in B-Cell. The material was collected and placed in a 208-liter container that was moved to D-Cell in July 1994 because of flammability considerations. (Torches were being used to cut up equipment being removed from B-Cell.) This container was transferred to the PUREX Storage Tunnels in 1996.

PNNL designated the window oil in 1994 based on process knowledge. The window oil did not meet the criteria for listed waste. The material safety data sheet (MSDS) for the mineral oil listed a LD_{50} of 2 g/kg (Dermal Rabbit). A dilution factor of three was assumed to result from addition of absorbent material. The mineral oil and absorbent was designated as WT02.

4.2.6 Filters Containing Heavy Metals

Filters designed to collect heavy metals (e.g., barium, cadmium, chromium, lead) from the HLV Interim Waste Removal Action Project treatment process performed in 1996 (Chapter 3.0, Section 3.3.9) initially were stored in D-Cell where the treatment process took place. These filters are considered mixed waste. The filters were moved to B-Cell and will be transferred to the PUREX Storage Tunnels (or another permitted TSD), as discussed in Chapter 3.0, Section 3.3.2.

4.3 VAULT TANK WASTE INVENTORY AND CHARACTERISTICS

The HLV and LLV tanks have been used as holding tanks for feed solutions, feedstock tanks for process solutions, collection tanks for process effluents, and storage tanks for waste solutions since 1968. The vault tanks can receive solutions as described in Chapters 2.0 and 3.0. The HLV and LLV tank contents were sampled and analyzed in 1990. As part of the HLV Interim Action Removal Process, the HLV tank contents were sampled and analyzed in 1996. The HLV tanks were drained and flushed in 1996 (Chapter 3.0, Section 3.3.1.5).

4.3.1 1990 HLV and LLV Tank Contents Characterization

The volume of material in each of the tanks during the 1990 sampling event was reported as: tank 101, 5,580 liters; Tank 102, 7,100 liters; tank 103, 5,640 liters; Tank 104, 5,500 liters; Tank 105, 2,060 liters; Tank 106, 1,023 liters; and tank 108, 7,100 liters (PNL 1990). The material in Tank 107 had been transferred to Tank 112 in B-Cell earlier in the year for possible use in a treatability study. At the time of sampling, the material in Tank 112, which had originated in Tank 107, had a volume of 740 liters. The treatability study did not take place and the material was returned later to Tank 107. Waste tank contents were analyzed at the PNNL 325 laboratory.

Sampling for all tank contents, except for tanks 105 and 107, occurred in the remote-operated sample station, located in Room 145. This station used a shielded hood for sampling the tank contents. Sampling was performed with special sampling equipment located in the hood. Air jets were used for circulating the material to and through the sampler. The material from Tank 107 was being stored temporarily in Tank 112 and was sampled directly from Tank 112. A sample of Tank 105 material, leftover from an earlier analyses, had been found at the PNNL 325 Laboratory, and no additional samples were taken from Tank 105.

Analyses of the tank contents were conducted by the PNNL 325 Laboratory for several analytes, including ICP for total metals, anions by ion chromatography (IC), and pH and radiochemistry. All analyses used PNNL-specific methods in place at the time of sampling. Analytical results of the samples are provided in Tables 4-7, 4-8, and 4-9.

Data from this sampling event were used to evaluate and designate the material in tanks 101, 102, 103, 106, and 108 (PNL, 1990). The materials in tanks 104, 105, and 112 were not considered waste at that time, as it was planned to use the materials within the next 12 months, and were not designated. None of the tank contents met the criteria for listed waste. The waste was designated based on the concentrations of toxicity-characteristic listed metals. Tank 101 waste showed no concentrations above toxicity-characteristic regulatory limits, and therefore, was not designated as dangerous waste. Tank 102 waste was designated as characteristic waste for arsenic, (D004), barium (D005) and lead (D008). Tank 103 waste was designated as characteristic for barium (D005). Tank 106 waste showed no concentrations above TC regulatory limits, and therefore was not designated as a dangerous waste. Tank 108 waste was designated as a characteristic waste for chromium (D007).

In 1994, the remaining tank contents were declared waste and were designated based on the 1990 analytical results. The tanks contents had not been altered since the 1990 sampling event except for evaporation and addition of water due to evaporation. The waste in Tank 104 was designated as corrosive (D002) due to a pH of 1.4 and as characteristic for lead (D008). Tank 105 waste was designated as corrosive (D002), pH 1.5, and as characteristic for lead (D008). Tank 107 waste was designated as corrosive (D002), pH 0.7, and as characteristic for barium (D005), chromium (D007) and cadmium (D006).

The dangerous waste designations for the solutions stored in all of the HLV and LLV tanks are provided in Table 4-2.

4.3.2 1996 HLV Tank Contents Characterization

In 1996, the waste in the HLV tanks was removed, treated, and the filtrate transferred to the DST system for storage as part of the HLV Interim Waste Removal Action (Chapter 3.0, Section 3.3.9). Solids from the treatment process have been designated as mixed waste, product, and LLW and stored appropriately. As part of these removal activities, samples from the HLV tanks containing waste were collected. Tank 106 contained no liquid before liquid waste treatment activities and therefore was not sampled. The samples from the remaining HLV tanks were analyzed to provide information necessary for the cleanout and treatment process. In addition, samples were taken from the last rinsate used during the HLV waste removal activities. The information collected is provided in the following sections.

A higher level of quality assurance and quality control is associated with the data referenced in this section than for the data on the 1990 sampling and analyses event. Therefore, additional detail on sampling and analyses activities is provided.

4.3.2.1 HLV Tank Waste Sampling and Analyses

For ALARA concerns, the use of the remote operated sample station location in Room 145 was not used. Waste was transferred from the HLV tanks to Tank 112 in B-Cell where the waste was sampled using the closed loop sampler on the tank. A representative sample was collected by allowing the tank solution to recirculate through the sample bottle before stopping the air jet. The turbulence of the transfer from the HLV tanks to Tank 112 in B-Cell was expected to have mixed the waste thoroughly. The following information is based on entries in the Solution Transfer Log for the 324 Building.

Initially, on April 25, 1996, the contents of Tank 104 (628 liters) were transferred to Tank 105, mixing the waste from tanks 105 and 104. On April 26, Tank 104 was rinsed with 170 liters of clean water that was transferred to Tank 105. On April 29, Tank 104 was rinsed again with 240 liters of water that was transferred to Tank 112 and to Tank 107. Additional water volumes (ranging from five to 30 liters) were added during each transfer due to jet dilution. On June 3 and 4, 1996, the contents of Tank 107 (444 liters) were transferred to the empty Tank 104, and the contents of Tank 104 (446 liters) were transferred to Tank 112. These contents were sampled and returned to Tank 107. The empty Tank 104 was rinsed with 168 liters of 0.01M nitric acid. This dilute acid was transferred to Tank 112 and to Tank 107. Tank 104 was rinsed again with 153 liters of 0.01M nitric acid. This dilute acid was again transferred to Tank 112 and to Tank 107. The final volume in Tank 107 on June 4, 1996, was approximately 860 liters. On June 4, 1996, the contents of Tank 105 (2,130 liters) was transferred to an empty Tank 104. On June 5, 1996, approximately 784 liters were transferred from Tank 104 to Tank 112 and sampled. The final volume in Tank 104 on June 5, 1996, was approximately 1,390 liters. The final volume of Tank 112 on June 5, 1996, was approximately 820 liters.

Two samples were taken from Tank 112 during each sampling event. These samples were combined in the laboratory before any sample preparation and analyses. The samples from the Tank 104/105 composite were found to be colorless, clear liquids with a minute amount of settled solids. The samples from Tank 107 were opaque brown liquids. The samples were transferred to the PNNL 325 Laboratory for analyses.

The samples were analyzed by ICP for metals and by IC for anions. Because of the high radioactivity dose rates, both samples needed significant dilution to ensure that worker exposure was ALARA. The reported results are corrected for these dilutions.

For the anion analyses, the samples were diluted 1,140-fold so the radioactivity dose level fell within the allowable levels for personnel safety. The diluted sample aliquots were analyzed by IC for fluoride, chloride, bromide, nitrate, nitrite, phosphate, and sulfate. All quality control requirements were met. Both samples showed significant concentrations of nitrate. The Tank 104/105 composite averaged 13,000 µg/mL nitrate; Tank 107 waste averaged 56,000 µg/mL nitrate. The Tank 104/105 composite also showed detectable levels of sulfate (average 850 µg/mL). All other anion analyses were below detection limits. Results are summarized in Table 4-10.

Analyses by ICP/mass spectroscopy (ICP/MS) took place on July 29, 1996. Because of the high instrument background, sodium and potassium results were not obtained. A process blank and blank spike were analyzed along with samples. (Process blank was the PNNL 325 Laboratory term for method blank. Reagents without the sample were processed through the entire digestion process and analyzed in the same manner as the samples.) The ICP/MS detected some contamination in the process blank. The process blank results for aluminum, calcium, iron, magnesium, lead, and zinc were comparable in some cases to the results reported for the samples. In addition, silicon was detected in the nitric acid blank at approximately 40 to 60 percent of the sample results. The ICP analysis of the process blank also indicated the presence of aluminum, iron, zinc, and calcium at similar concentrations in the process blank. As a result, it is believed that the contamination of aluminum, iron, zinc, and calcium most likely came from the preparation method. It is likely that analytes detected in the blanks at levels equal to the samples show a false positive for the sample results. The uncertainty associated with manganese, zinc, and technetium results were high, indicating a potential instability in the instrument. Both the Tank 104/105 composite waste sample and the Tank 107 waste sample were run in duplicate and all results and an average are presented in Table 4.11.

The ICP/MS analyses showed relatively high levels of cadmium, chromium, lead, and selenium for both samples. Also, the Tank 107 sample waste is high for barium. This is consistent with the 1990 sampling results, even though direct comparisons are difficult because of the evaporation and addition of water during the intervening years, and the mixing of Tank 104 and -105 contents.

On July 1, 1996, before analyses by ICP/MS, the Tank 104/105 composite also was analyzed by ICP/Atomic Emission Spectroscopy (ICP/AES). Because of limited quality control samples, the ICP/AES uncertainty is greater than normal. The results should be used with caution. The Tank 104/105 composite was acid digested and diluted to approximately 125-fold to bring the radioactivity levels to a safe level. Matrix spike, serial dilution, and post-digestion spike were not performed because the concentration of the analytes were expected to be at the detection limits and the analyst would have been unnecessarily exposed to high radioactivity levels. The blank spike was not performed because the dilution applied would have resulted in the analytes not being detectable above the ICP estimated quantitation limit (EQL).

The results for the ICP/AES analyses showed chromium and lead exceeding the TC regulatory limits. The measured lead concentrations were within a factor of two times the detection limit, and therefore, actually might not have been present. The lead measurement results might be due to interference from high concentration of lanthanum. The samples did not show levels of silver, arsenic, barium, cadmium, or selenium above TC regulatory limits.

Potential contaminants of concern based on this 1996 sampling event are lead, barium, chromium, cadmium, and selenium.

4.3.2.2 High-Level Vault Interim Removal Action Project Rinsate Sampling and Analyses

As part of the HLV Interim Waste Removal Action Project, in September 1996, the HLV tanks were rinsed three times, twice with a dilute nitric acid solution and finally with a dilute sodium carbonate solution (described in Chapter 3.0, Section 3.3.9). A sample of the rinse solution was collected from Tank 112. The sample was analyzed by the PNNL 325 Laboratory. The rinse sample was filtered and found to be 0.3 percent solids by weight. The sample was acid digested and was analyzed by ICP/MS. The matrix spike and the blank spike were within acceptable recoveries. The method blank contained lead at concentration greater than five percent of that found in the sample, and showed a relative percent difference (RPD) for chromium of 33 percent. The results of these analyses are in Table 4.12.

These analyses might indicate constituents remaining in the tanks and piping after the HLV Interim Waste Removal Action Project activities were complete. Potential contaminants of concern based on the rinsate analyses include arsenic, chromium, and lead.

4.3.3 Tank Contents Summary

The LLV tanks 101, 102, and 103 stored process condensates and decontamination solutions (e.g., from decontamination of the airlock, cells manipulators, fume hoods). During the WSEP and NWVP, tank 108 was reported not to have been used extensively, partly due to its limited size and transfer capabilities. However, during the FRG Program, tank 108 was used routinely to receive clean acids from the acid fractionater. The 1990 results indicate that the concentrations of halides (e.g. fluorides, chlorides) were higher in tank 108 than in the other LLV tanks. It is expected that the concentration of halides was higher in the acids than that of the process condensates due to these constituents being concentrated in the fractionator bottoms.

For the HLV, tanks 104 and 105 analytical results are most representative of waste generated during the FRG Program. The solution in Tank 104 was essentially the HLV tank heel of cesium-137 feedstock for the FRG canister fill activities. Likewise, solution in Tank 105 was the HLV tank heel of strontium-90 feedstock for the FRG canister fill activities. The FRG Program feed material contained residual fluorides and chlorides from the conversion performed in the 200 Areas of original feed material to nitrates. The 1990 analytical results indicated fairly high levels of chloride and fluoride concentrations for Tank 105. High nitrates were noted for both tanks in 1990 and for the composite in 1996.

Tank 107 was used routinely during the WSEP and NWVP to contain feed materials before the materials were sent to the melter-feed makeup tank 114 in B-Cell. The feed material for the NWVP was stored in Tank 107 when the contents were declared waste. Tank 106 was used during the NWVP to accept high-level liquid waste from the 325 Building. The 1990 analyses results indicate that Tank 106 contents were more typical of the process condensates such as those stored in the LLV tanks.

4.4 CONSTITUENTS OF CONCERN FOR CLOSURE

The constituents of concern for closure are those constituents that have been found in the waste or are expected in the waste material based on process knowledge. The original HLV and LLV tank waste was designated as dangerous waste due to concentrations of lead, barium, chromium, arsenic (at near detection limits), and also due to corrosivity. The 1996 sampling and analyses event showed concentrations of lead, barium, chromium, cadmium, and selenium at high levels. During waste designation of the collected B-Cell floor dispersible debris, cadmium, chromium, and lead were found in concentrations that designate as dangerous waste.

Based on these results, lead, chromium, barium, cadmium, and possibly selenium and arsenic are considered to be constituents of concern for closure. This list could be revised as more information is obtained through additional sampling and/or waste designation activities.

Organic substances are not expected to be of concern during closure. History of the HLV and LLV indicates that the addition of organic substances to the tanks was limited to cell cleaning activities or as contaminants. The organic substances were present only during the WSEP program that completed activities in 1972. The high temperatures and constant airflow would make retention of volatile organics improbable. The high radiation field in the tanks is expected to have degraded any organic molecules that might have been left in the tanks following the last program use in 1987.

Process history identifies the primary radioactive substances used in the REC/HLV as strontium-90 and cesium-137. While these are not considered constituents of concern for closure, the waste from the 324 Building can be a mixed waste. It is not expected that the dangerous waste components and radioactive components will separate; therefore, in the event a liner has failed and soils are potentially impacted the strontium-90 and cesium-137 might be useful as tracers in indicating the location of waste materials.

It is expected that the majority of the unit will be closed using 'debris rule standards,' which allows for the use of an approved treatment technology and a clean debris surface as a performance standard. Therefore the closure performance standards for the portions of the unit being closed by the 'debris rule standard' do not depend directly on knowledge of constituents of concern. However, sampling is expected on rinsates from the piping and tanks and, if necessary, post-closure activities could be conducted that do require more information on constituents of concern. In addition, if necessary to coordinate any future closure activities with the operable unit, as discussed in Chapter 8.0, this information on the constituents of concern for closure will be used in the clean up of areas of the operable unit associated with the 324 Building.

Table 4-1. Radiochemical Engineering Cells Waste Dangerous Waste Characteristics.

Waste type	Location	Waste designation	Dangerous constituents/ characteristic	Estimated quantity (cubic meters)
Floor debris[a]	B-Cell	D006, D007, D008, WT02	Cadmium, chromium, lead, toxic	2.5
Elemental lead	B-Cell	D008, WT01	Lead, toxic	1.0
Dried melter feed heels	B-Cell	D007, D008, WT01	Chromium, lead, toxic	0.17
Liquid metal seal	B-Cell	D006, D008, WT01	Cadmium, lead, toxic	<0.2
Window oil and oil absorption material	D-Cell	WT02	Toxic	<0.2

[a] Includes dispersible material, tools, equipment, and pieces of metal.

Table 4-2. Designation of Waste in Vault Tanks.

Tank[a]	Waste type	Waste designation	Dangerous constituents/ characteristic	Estimated Volume 1990 (liters)
High-Level Vault Tanks				
104	Dilute strontium-90 nitrate and cesium-137 nitrate solutions	D002, D008, WT02	Corrosive, lead, toxic, pH 1.4	5,500
105	Dilute strontium-90 nitrate and cesium-137 nitrate solutions	D002, D008, WT02	Corrosive, lead, toxic, pH 1.5	2,060
106	Low-level waste process solution	None	None	1,020
107	NWVP liquid process feedstock solution	D005, D006, D007, D002, WT02	Barium, cadmium, chromium, corrosive, toxic	740[b]
Low-Level Vault Tanks				
101	Low-level condensate	None	None	5,580
102	Low-level condensate	D004, D005, D008	Arsenic, Barium, Lead	7,100
103	Low-level condensate	D005	Barium	5,640
108	Contaminated nitric acid	D007	Chromium	7,100

[a] Location of waste before removal from the tanks.
[b] Material was being stored in Tank 112 in B-Cell at the time sampling.

Table 4-3. Feedstock Compositions (Kg Oxide/MTU[c]).

		As Defined PW-4b	PW-4b-1	PW-4b-2	PW-4b-3	PW-4b-4	PW-4b-5	PW-4b-6	As Defined PW-7a	PW-7a-1	PW-7a-2	As Defined PW-8a	PW-8a-1	PW-8a-2
Inerts	Na_2O	--	--	--	--	--	--	--	6.872	6.872	6.872	14.057	14.057	14.057
	Fe_2O_3	1.511	3.294	3.294	1.511	1.511	1.511	1.511	3.022	3.022	3.022	27.225	27.225	27.225
	Cr_2O_3	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	1.151	1.151	1.151
	NiO	0.141	1.049	1.049	0.141	0.141	0.141	0.141	0.141	0.141	0.141	0.566	0.566	0.566
	P_2O_5	0.672	0.672	0.672	0.672	0.672	0.672	0.672	6.339	6.339	6.339	1.342	1.342	1.342
	Gd_2O_3	--	--	--	--	--	--	--	10.360	10.360	---(RE)	--	--	--
Fission Products	Rb_2O	0.354	0.354	0.178	0.354	0.354	0.354	0.354	0.354	0.354	0.178	0.354	0.354	0.178
	SrO	1.059	1.059	1.059	1.059	1.059	1.059	1.059	1.059	1.059	1.059	1.059	1.059	1.059
	Y_2O_3	0.598	0.027(RE)[a,b]	0.027(RE)	0.598	0.027(RE)	0.027(RE)	0.598	0.598	0.027(RE)	0.427	0.598	0.027(RE)	0.427
	ZrO_2	4.944	4.944	4.944	4.944	4.944	4.944	4.944	4.944	4.944	4.944	4.944	4.944	4.944
	MoO_3	5.176	6.375	6.375	6.375	6.375	6.375	6.375	5.176	6.375	6.375	5.176	6.375	6.375
	Tc_2O_7	1.291	---(Mo)	---(Mo)	---(Mo)	---(Mo)	---(Mo)	---(Mo)	1.291	---(Mo)	---(Mo)	1.291	---(Mo)	---(Mo)
	RuO_2	2.972	---(Fe)	---(Fe)	2.972	2.972	2.972	2.972	2.972	2.972	---(Fe)	2.972	2.972	---(Fe)
	Rh_2O_3	0.480	0.304(Co)	0.304(Co)	0.304(Co)	0.480	0.480	0.480	0.480	0.304(Co)	0.304(Co)	0.480	0.304(Co)	0.304(Co)
	PdO	1.483	---(Ni)	---(Ni)	---(Ni)	1.483	1.483	1.483	1.483	---(Ni)	---(Ni)	1.483	---(Ni)	---(Ni)
	Ag_2O	0.088	0.038	---	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088
	CdO	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097
	TeO_2	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.725	0.725
	Cs_2O	2.880	2.880	0.963(K)	2.880	2.880	2.880	2.880	2.880	2.880	0.963(K)	2.880	2.880	0.963(K)
	BaO	1.567	1.567	1.567	1.567	1.567	1.567	1.567	1.567	1.567	1.567	1.567	1.567	1.567
	La_2O_3	1.480	3.213(RE)	3.213(RE)	1.480	3.213(RE)	3.213(RE)	1.480	1.480	3.213(RE)	8.756(RE)	1.480	3.213(RE)	5.114(RE)
	CeO_2	3.323	6.426(RE)	6.426(RE)	3.323	6.426(RE)	6.426(RE)	3.323	3.323	6.426(RE)	10.489(RE)	3.323	6.426(RE)	10.228(RE)
	Pr_6O_{11}	1.482	0.669(RE)	0.669(RE)	1.482	0.669(RE)	0.669(RE)	1.482	1.482	0.669(RE)	1.998(RE)	1.482	0.669(RE)	1.065(RE)
	Nd_2O_3	4.522	2.276(RE)	2.276(RE)	4.662	2.276(RE)	2.276(RE)	4.522	4.522	2.276(RE)	6.496(RE)	4.522	2.276(RE)	3.622(RE)
	Pm_2O_3	0.123	---(RE)	---(RE)	0.123	---(RE)	---(RE)	---	0.123	---(RE)	---(RE)	0.123	---(RE)	---(RE)
	Sm_2O_3	0.924	0.402(RE)	0.402(RE)	0.924	0.402(RE)	0.402(RE)	0.924	0.924	0.402(RE)	1.056(RE)	0.924	0.402(RE)	0.639(RE)
	Eu_2O_3	0.200	0.107(RE)	0.107(RE)	0.200	0.107(RE)	0.107(RE)	0.200	0.200	0.107(RE)	0.200(RE)	0.200	0.107(RE)	0.170(RE)
	Gd_2O_3	0.137	0.268(RE)	0.268(RE)	0.137	0.268(RE)	0.268(RE)	0.137	0.137	0.268(RE)	0.821(RE)	0.137	0.268(RE)	0.426(RE)
Actinides	U_3O_8	1.169	2.078	---	---	---(Cm)	---	2.078	11.689	12.701	---(Ce)	11.689	12.772	---(RE)
	NpO_2	0.865	---(U)	---	---	---(Cm)	---	---(U)	0.865	---(U)	---(RE)	0.865	---(U)	---(RE)
	PuO_2	0.010	---(U)	---	---	---(Cm)	---	---(U)	0.103	---(U)	---(RE)	0.174	---(U)	---(RE)
	Am_2O_3	0.181	---(RE)	---(RE)	---(Nd)	---(Cm)	---(RE)	---(Nd)	0.181	---(RE)	---(RE)	0.181	---(RE)	---(RE)
	Cm_2O_3	0.040	---(RE)	---(RE)	---(Nd)	---(Cm)	---(RE)	---(Nd)	0.040	---(RE)	---(RE)	0.040	---(RE)	---(RE)
Total		40.8	39.2	35.0	37.9	40.7	39.0	40.6	75.9	75.4	66.0	93.2	92.8	84.6

[a] Where used, chemical substitutes are shown in parentheses. Values listed represent actual amount present. If no value shown the weight included with substitute.

[b] RE = commercial rare earth mixture nominally containing wt% 0.2 Y_2O_3, 24.0 La_2O_3, 48.0 CeO_2, 5.0 Pr_6O_{11}, 17.0 Nd_2O_3, 3.0 Sm_2O_3, 0.8 Eu_2O_3, and 2.0 Gd_2O_3.

[c] MTU = metric ton uranium.

Table 4-4. Feedstocks for the RLFCM Program.

Element (present as oxides)	Nonradioactive slurry concentration (grams/liter)	Radioactive slurry concentration (grams/liter)
Al	0.59	1.48
B	5.10	21.8
Ba	0.40	3.78
Ca	0.91	6.25
Ce	0.14	-
Cr	0.29	0.73
Fe	2.10	6.87
K	0.80	--
La	0.40	5.36
Mg	0.29	2.62
Mn	0.12	0.99
Na	7.30	43.2
Nd	0.20	1.5
Ni	0.09	0.57
Si	0.37	23.2
Sr	2.90	9.28
Ti	0.32	0.3
Zn	0.04	0.19
Zr	0.04	0.11
Pb	--	2.6

Table 4-5. Chemical Composition of Strontium and Cesium Waste Feedstocks for the FRG Program.

Oxide	Strontium-90 solution (grams/liter)	Cesium-137 solution (grams/liter)
Al_2O_3	1.35	--
B_2O_3	6.91	10.19
BaO	2.79	0.57
CaO	6.35	2.62
Ce_2O_3	--	--
Cr_2O_3	0.78	0.65
Cs_2O	--	45.99
Fe_2O_3	4.95	3.23
La_2O_3	10.08	0.62
MgO	1.23	0.72
MnO_2	0.98	0.18
Na_2O	40.92	31.33
Na_2SO_3	--	--
Nd_2SO_3	2.04	--
NiO	--	0.53
PbO	--	--
SiO_2	3.01	1.42
TiO_2	0.36	0.18
ZrO	0.46	--

Table 4-6. Dangerous Waste Constituent Concentrations in Collected B-Cell Floor Dispersible Material (in ppm).

Constituent	run*	EC-14	EC-15	EC-16	EC-17	EC-19	EC-21	EC-22	EC-23	EC-24	EC-25	TC Limits
Arsenic	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	average	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	5
Barium	A	0.70	ND	1.60	1.10	ND	1.50	1.70	0.96	1.20	1.00	
	B	0.58	ND	2.00	0.97	ND	1.50	1.20	1.10	0.74	1.00	
	average	**0.64**	**ND**	**1.80**	**1.04**	**ND**	**1.50**	**1.45**	**1.03**	**0.97**	**1.00**	100
Cadmium	A	0.38	ND	0.99	0.74	ND	0.90	0.62	0.62	0.36	0.60	
	B	0.31	ND	1.00	0.72	ND	0.90	0.56	0.78	0.37	0.60	
	average	**0.35**	**ND**	**1.00**	**0.73**	**ND**	**0.90**	**0.59**	**0.70**	**0.37**	**0.60**	1
Chromium	A	0.10	ND	0.92	1.20	ND	0.40	0.28	0.29	6.4	0.30	
	B	0.08	ND	0.82	1.00	ND	0.30	0.25	0.31	6.1	0.30	
	average	**0.09**	**ND**	**0.87**	**1.10**	**ND**	**0.35**	**0.27**	**0.30**	**6.3**	**0.30**	5
Lead	A	ND	ND	7.2	2.9	ND	15	54	5.4	54	6.9	
	B	0.18	ND	62	4.6	ND	11	1.7	22	15	3.0	
	average	**0.09**	**ND**	**34.6**	**3.8**	**ND**	**13**	**27.9**	**13.7**	**34.5**	**5.0**	5
Selenium	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	average	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	1
Silver	A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	average	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	5

Legend:

EC =	engineered container
ICP/AES =	inductively coupled plasma/atomic emission spectroscopy
ND =	not detected
ppm =	parts per million
TC =	toxicity characteristic
TCLP =	toxicity characteristic leaching procedure

* Results from duplicate runs (A & B) and the average values are presented.

NOTES: Samples were analyzed by ICP/AES. Analyses were performed on an acid-digest of a TCLP extract. Designation was based on the average values; underlined values are above TC regulatory limits.

Table 4-7. Analytical Results of Low-Level Vault Tanks 1990 Sampling.

Analyses	Tank 101	Tank 102	Tank 103	Tank 108
pH	6.3	7.3	8.4	<1
Total uranium, g/mL	0.17	0.11	0.30	<0.19
Fluoride*, ppm	<20	1.5	7.6	146
Chloride*, ppm	143	65	166	218
Nitrate*, ppm	60	<0.8	0.8	27,900
Nitrite*, ppm	<40	<0.8	<0.8	1,000
Phosphate*, ppm	1630	405	55	<40
Sulfate*, ppm	204	115	188	152
^{90}Sr, d/m-mL	1.38 E6	3.65 E5	1.76 E6	2.16 E7
^{137}Cs, d/m-mL	6.54 E6	1.81 E6	6.80 E6	5.25 E8
^{134}Cs, d/m-mL	2.41 E3	1.10 E3	3.83 E3	NA
^{154}Eu d/m-mL	3.11 E4	NA	NA	NA
^{241}Am d/m-mL	NA	NA	NA	NA
Total alpha d/m-mL	5.04 E5	2.31 E3	8.83 E3	5.41 E3

Key

* = performed by ion chromatography

Isotopes:
^{90}Sr = strontium-90
^{137}Cs = cesium-137
^{134}Cs = cesium-134
^{154}Eu = europium-154
^{241}Am = americium-241
d/m-mL = disintegrations per minute per milliliter
µg/mL = micrograms per milliliter
ppm = parts per million
NA = not available

Table 4-8. Analytical Results of High-Level Vault Tanks, 1990 Sampling.

Analyses	Tank 104	Tank 105	Tank 106	Tank 107
pH	1.4	1.5	6.19	0.7
Total uranium, g/mL	0.17	0.96	4E-2	4.9
Fluoride*, ppm	NA	648	34	NA
Chloride*, ppm	<500	3,678	152	<15
Nitrate*, ppm	6,287	38,650	NA	123,600
Nitrite*, ppm	NA	300	89	NA
Phosphate*, ppm	NA	<0.4	<40	NA
Sulfate*, ppm	NA	1976	<40	NA
^{90}Sr, d/m-mL	1.52 E9	1.40 E10	3.54 E6	9.23 E10
^{137}Cs, d/m-mL	1.09 E9	2.64 E10	5.22 E6	1.42 E11
^{134}Cs, d/m-mL	NA	NA	4.22 E4	6.47 E8
^{154}Eu d/m-mL	NA	NA	5.69 E4	1.50 E9
^{241}Am d/m-mL	NA	1.55 E5	NA	NA
Total alpha d/m-mL	1.65 E4	NA	9.00 E4	2.32 E9

Key

* = performed by ion chromatography.

Isotopes:
^{90}Sr = strontium-90
^{137}Cs = cesium-137
^{134}Cs = cesium-134
^{154}Eu = europium-154
^{241}Am = americium-241
d/m-mL = disintegrations per minute per milliliter

ppm = parts per million
NA = not available
µg/mL = micrograms per milliliter
g/mL = grams per milliliter

Table 4-9. Vault Tanks Inductively Coupled Plasma Mass Spectroscopy Analytical Results, 1990 Sampling (in µg/mL).

Constituent	Low-Level Vault Tanks				High-Level Vault Tanks		
	Tank 101	Tank 102	Tank 103	Tank 108	Tank 104	Tank 106	Tank 107
Aluminum	478	2000	379	23.5	3.0	367	175
Arsenic	NA	24	NA	NA	NA	4.9	NA
Boron	396.4	176	281	42	5.47	262	131
Barium	97.5	404	822	70	1.90	78.6	1074
Beryllium	NA	NA	NA	NA	NA	NA	NA
Calcium	204.3	734	172	25.0	12.6	165	394
Cadmium	NA	NA	NA	NA	NA	NA	44
Cobalt	NA	NA	NA	NA	NA	NA	NA
Chromium	4.87	1.1	0.6	27	0.48	.43	405
Copper	NA	1.7	0.79	NA	5.04	26.8	NA
Dysprosium	NA	NA	NA	NA	NA	NA	NA
Iron	40.4	237	24.9	100	7.88	144	12,200
Potassium	79	99	79	NA	2.1	22	NA
Lanthanum	NA	NA	NA	NA	2.0	NA	820
Lithium	NA	NA	NA	NA	NA	NA	NA
Magnesium	10.3	25	11.2	NA	2.84	13	44
Manganese	2.66	1.6	1.1	645	2.42	0.51	220
Sodium	1,477	3,950	1,497	NA	45.9	731	NA
Nickel	8.22	1.5	NA	30	1.49	3.6	NA
Phosphorus	477	162	29	NA	11.5	NA	360
Lead	NA	7.4	4.4	NA	15.6	2.10	NA
Rhodium	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA
Silicon	310	1,650	429	28	19.6	190.8	390
Strontium	2	7.93	1.8	2.5	15.4	1.6	660
Tellurium	NA	NA	NA	NA	NA	NA	NA
Titanium	3.9	14.8	2.7	25	0.19	2.80	130
Vanadium	NA	NA	NA	NA	NA	NA	NA
Zinc	2.1	16.5	2.8	12	1.2	5.2	93
Zirconium	2.0	6.55	1.6	740	2.78	1.4	620

NA = not available

Table 4-10. High-Level Vault Tanks Ion Chromatography Analytical Results, 1996 Sampling (in µg/g).

		Tank 104/105 composition				Tank 107 contents		
			Duplicate	Average		Sample	Duplicate	Average
Fluoride		<290	<290	<290		<290	<290	<290
Chloride		<290	<290	<290		<290	<290	<290
Bromide		<290	<290	<290		<290	<290	<290
Nitrite		<570	<570	<570		<570	<570	<570
Nitrate		12,300	13,700	13,000		54,000	58,000	56,000
Phosphate		<570	<570	<570		<570	<570	<570
Sulfate		800	900	850		<570	<570	<570

Table 4-11. High-Level Vault Tanks Inductively Coupled Plasma/Mass Spectroscopy Analytical Results, 1996 Sampling

Constituent	Tank 104/105 composite				Tank 107 contents		
Specific Gravity:			1.007				1.076
ICP, in µg/g	Sample	Duplicate	Average		Sample	Duplicate	Average
Aluminum	74	80	77		164	166	165
Cadmium	5	6	6		30	27	29
Calcium	1,930	1,700	1,815		2,850	2,480	2,,665
Cesium	145	158	152		517	575	546
Chromium	120	110	115		357	390	374
Copper	10	18	14		30	27	29
Dysprosium	<5	<5	<5		15	10	13
Iron	1,500	1,490	1,495		9,990	8,440	9,215
Lanthanum	253	265	259		760	827	794
Lead	170	162	166		109	77	93
Magnesium	65	51	58		90	84	87
Manganese	87	79	83		220	240	230
Molybdenum	43	47	45		767	847	807
Neodenium	44	41	43		2,480	2,630	2,555
Nickel	84	79	82		320	324	322
Selenium	80	<50	65		<50	150	100
Silicon	537	405	471		335	532	434
Strontium	159	156	158		362	383	373
Tellurium	<5	25	15		30	41	36
Titanium	9	9	9		15	13	14
Uranium	44	41	43		2420	2620	2520
Vanadium	15	12	14		15	14	15
Zinc	110	120	115		100	120	110
Zirconium	13	15	14		150	120	135

Table 4-12. Rinsate Sample High-Level Vault Tanks
Inductively Coupled Plasma/Mass Spectroscopy
Analyses, 1996 Sampling (in µg/g).

	Sample	Duplicate-1	Duplicate-2	Average
Antimony	<1	<1	<1	<1
Arsenic	10.9	12	8.1	10
Barium	1.2	<1	<1	1
Beryllium	4.4	6.2	4	5
Cadmium	<1	<1	<1	<1
Cerium	7.7	6.8	6.8	7
Cesium	22	24	16	21
Chromium	10	14	10	11
Cobalt	<1	<1	<1	<1
Copper	18	16.8	12	16
Dysprosium	<2	<2	<2	<2
Lanthanum	11	14	11	12
Lead	8.7	10	5.5	8
Magnesium	46	47	40	44
Manganese	8.7	8.2	6.4	8
Molybdenum	4	4	2.8	4
Neodenium	25	25	13	21
Niobium	<1	<1	<1	<1
Nickel	9	7	7	8
Palladium	2	4	4	3
Rhodium	10	10.4	9.3	10
Rubidium	<4	<4	<4	<4
Strontium	52	51	47	50
Tin	7	6	6	6
Uranium	37.8	20	25	28
Vanadium	48	49	41	46
Zinc	191	178	210	193
Zirconium	18	22	20	20

CONTENTS

FIGURES

TABLES

This page intentionally left blank.

5.0 GROUNDWATER MONITORING

Closure of the 324 Building TSD unit will include removal of the REC unit components (Table 2-1) and removal of soil to a depth of 0.5 meter (m) below the TSD unit footprint. Closure surveillance and maintenance of the 324 Building will be required as addressed in Chapter 8.0. Groundwater monitoring and reporting will be included as part of the 300-FF-5 operable unit (OU).

5.1 BACKGROUND

Information on the groundwater monitoring for the Hanford Site is provided in annual reports (e.g., PNNL-11470). The geologic and hydrogeologic information provided in this chapter is summarized from the PNNL report.

The geology and hydrogeology of the 300 Area is well characterized and the groundwater is monitored through an extensive well network collecting data to meet the requirements of the RCRA, CERCLA, and Atomic Energy Act. Groundwater monitoring is conducted by DOE-RL and its contractor. In accordance with the Tri-Party Agreement, groundwater in the 300 Area is included in the 300-FF-5 OU and is being investigated as part of the CERCLA Remedial Investigation/Feasibility Study process. The only constituents detected in the groundwater beneath the 324 Building in levels greater than the proposed interim drinking water standards are uranium and sometimes strontium-90. The 300-FF-5 OU consists of the aquifers beneath the 300-FF-01 and 300-FF-2 source OU and is bounded by the Columbia River on the east (Figure 5-1).

Groundwater for the 324 Building is addressed in the 300-FF-5 groundwater OU (Figure 5-1). A combined Record of Decision was issued in July 1996 for the 300-FF-1 OU (final) and the 300-FF-5 OU (interim). Actual or threatened releases from the 300-FF-2 OU waste sites to the groundwater are addressed in a future Record of Decision and will include coordination between CERCLA and RCRA (DOE/RL-89-14, DOE.RL-93-21, DOE/RL-94-85).

RCRA groundwater monitoring is governed by 40 CFR 265, Subpart F. There are no RCRA groundwater activities currently occurring in the vicinity (within 305 meters) of the 324 Building. The only RCRA groundwater monitoring program in the 300 Area is the 300 Area Process Trenches (316-5), located north of the 324 Building (Figure 5-1). However, within the 300 Area there are 39 active monitoring wells. These wells are part of the groundwater monitoring program for CERCLA, RCRA, and Atomic Energy Act. A number of these wells are located in the vicinity of the 324 Building (see Section 5.3).

5.2 GEOLOGY, HYDROLOGY, AND LAND USE HISTORY

An overview of the geology, hydrology, and land use history is provided in the following sections. The land use history is specific to the 324 Building.

5.2.1 Geology

The Hanford Site is a part of the Pasco Basin that lies in the Columbia Plateau, a broad plain situated between the Cascade Range to the west and the Rocky Mountains to the east. The Columbia Plateau was formed by a thick sequence of Miocene Age tholeitic basalt flows. The basalt and sedimentary rocks have been folded and faulted over the past 17 million years, creating broad structural and topographic basins separated by asymmetric anticlinal ridges. The stratigraphic units underlying the Hanford Site include, in ascending order, the Columbia River Basalt Group, Ringold Formation, Plio-Pleistocene unit, early Palouse soil, and the Hanford formation. A regionally discontinuous veneer of Holocene alluvium, colluvium, and/or eolian sediments overlies the principal geologic units.

There are thin, intermittent Eolian deposits in the 300 Area on top of the Hanford formation. Beneath the Hanford formation lies the Ringold Formation and then the Saddle Mountain Basalts (Figure 5-2).

The soil immediately underlying the 324 Building is wind-deposited sand and the upper portion of the Hanford formation. The Hanford formation consists of sandy gravel with silt and sand stringers. The soils underlying the HLV, at an approximate depth of six meters below surface grade, lie in the upper portion of the Hanford formation. This part of the formation consists of the pebble-to-boulder gravel growing finer with depth to very fine-to-medium gravel.

5.2.2 Hydrogeology

Groundwater is present in both unconfined and confined aquifers at the Hanford Site. The unconfined aquifer generally is located in the unconsolidated to semiconsolidated Ringold and Hanford formations that overlie the basalt bedrock. The saturated thickness of the unconfined aquifer system is greater than 180 meters in some areas but pinches out along the flanks of the basalt ridges.

The unsaturated zone beneath the 324 Building receives no direct precipitation and provides no natural infiltration to the water table other than that provided from outside the structure's shadow. The shadow reduces, but does not completely prohibit, natural gravity flow of infiltrated water beneath the structure. The water content in the unsaturated zone ranges from two to seven percent. The floor of the HLV is approximately six meters below grade and greater than six meters above the average water table.

The uppermost unconfined aquifer in the 300 Area consists of Hanford formation gravels and sands and Ringold Formation gravels and sands with varying amounts of silt and clay. The water table is within the Hanford formation in most of the 300 Area. Depth to the water table in the 300 Area varies from <1 meter near the Columbia River to approximately 17 meters, and groundwater generally flows eastward toward the Columbia River (Figure 5-3).

The water in the unconfined aquifer travels through the sands and gravels of the Hanford formation and more consolidated materials of the Ringold Formation. The unconfined aquifer beneath the 324 Building has an average water table depth of 13.1 meters below grade and flows from the northwest to the southeast to the Columbia River during normal river stage heights (Figure 5-4). The shallow portion of the aquifer is primarily in the porous Hanford formation where the flow rate ranges from 0.5 to 107 meters per day, depending on the stage height of the river and the location within the 300 Area. The portion of the aquifer beneath the 324 Building is in the slower moving region. The pH of the aquifer environment is neutral (5 to 9), with very low composition of clay and organic materials.

The water table fluctuates approximately 0.9 to 1.2 meters with the river stages as the river forms a hydraulic barrier to groundwater flow, flattening the gradient during high flow periods. This physical characteristic influences the direction of flow, flow rate of water and constituents, and dispersion of constituents. The potential for groundwater flow in varying (and sometimes opposite) directions makes selection of up- and downgradient wells more complex. During high flow periods, the groundwater flows more toward the south (Figure 5-5) creating a pathway for uranium and other contaminants to flow from the 316-and 316-2 Process Ponds and nearby trenches toward the 324 Building and to be sampled via the 399-3-11 well. However, the ultimate flow direction from the 324 Building remains toward the Columbia

River to the southeast. Figures 5-3, 5-4, and 5-5 show groundwater flow directions for the 300 Area and the 324 Building.

5.2.3 Land Use History

The eastern portion of the 324 Building is built over the 618-6 Burial Ground. The 618-6 Burial Ground was established in 1943 for the disposition of uranium contaminated solid waste. The material from this burial ground was moved several times during its active history. In 1962, the 618-6 Burial Ground contents were removed to the 618-10 Burial Ground. The 618-10 Burial Ground is located in the 600 Area, approximately 12 kilometers north of the 300 Area and east of Route 4S. The groundwater monitoring well 399-3-11 is situated in the old 618-6 Burial Ground (Figure 5-6).

In addition to the 618-6 Burial Ground, there are the north (316-2) and south (316-1) process ponds to the north of the 324 Building (Figure 5-1). These waste facilities discharged uranium and fission products to the vadose zone.

5.3 GROUNDWATER ASSESSMENT/MONITORING INFORMATION

Two contaminant plumes migrating within the 300 Area affect the groundwater quality in the vicinity of the 324 Building (Figure 5-7). A tritium plume is migrating south from the 200 Areas and is present near the 324 Building. A second plume, originating from the 300 Area process trenches and flowing under the 324 Building, contains uranium, strontium, nickel, copper, trichloroethene, and dichloroethene. A third plume migrating in the 300 Area, consisting of technetium and nitrate, is not affecting the groundwater in the vicinity of the 324 Building. The plumes are monitored for natural attenuation under the Record of Decision for the 300-FF-5 OU.

Within the 300 Area, there are 39 wells. These wells are a part of the groundwater monitoring program for CERCLA, RCRA, and Atomic Energy Act. The existing contaminant plumes would interfere with monitoring of the HLV to a limited extent because strontium-90, a constituent identified in the HLV, is present in the existing plumes at a significant concentration. Strontium concentrations in the well nearest the 324 Building (well 399-3-11) have remained consistently near the interim drinking water standard level of 0.31 Bq/L. Uranium concentrations in well 399-3-11 have exceeded the proposed interim drinking water standard of 20 μg/L (approximately 0.53 Bq/L) for the past three years. Other constituents identified as associated with the HLV tank contents include barium, chromium, lead, and selenium. These constituents were previously monitored for under the CERCLA program and were found to be below the drinking water standard levels in the groundwater, and in some cases, below background concentrations.

There are two groundwater monitoring wells associated with the 324 Building that are currently sampled under the existing groundwater monitoring program. The wells can adequately monitor the 324 Building for potential migration of constituents of concern during normal river height. Well 399-3-12 is located upgradient, approximately 180 meters northwest of the HLV. Well 399-3-11 is located downgradient, 40 meters southeast of the HLV, less than 31 meters from the eastern edge of the 324 Building. Table 5.1 lists these wells and all wells within 305 meters of the 324 Building (Also reference Figure 5-1.). Table 5-2 lists the RCRA groundwater monitoring wells installed in the 300 Area.

The data show uranium and strontium-90 exceeded the proposed interim drinking water standards (20 μg/L and 0.31 Bq/L, respectively) for 1995, 1996, and 1997 for well 399-3-11 and for wells upgradient and downgradient; these contaminants reside in the lower portions of the vadose zone from past practices. Cesium-137, barium, cadmium, chromium, and lead are not detected in routine groundwater sampling.

There appears to be a correlation between the higher than normal water levels in the wells and the higher concentrations of uranium and strontium-90 detected in groundwater samples. During the higher than normal water table levels associated with the higher than normal river level stages in 1995 to 1997, the uranium and strontium-90 trapped in the vadose zone might have been remobilized and transported in the groundwater.

5.4 CONCLUSION

There are soil and groundwater contamination from past-practice activities in the vicinity of the 324 Building (e.g., the 618-6 Burial Ground). Past-practice activities have contributed to contamination throughout the Hanford Site. Because of overlapping authorities, the TPA requires coordination by regulatory authorities. Specifically, in cases where TSD unit components are located within an existing operable unit to be remediated pursuant to either CERCLA or RCRA corrective action, integration is to be accomplished through coordination of some or all aspects of closure as might be appropriate.

It is recommended to coordinate cleanup of any contaminated soil and groundwater as a result of the TSD activities in this closure plan with the TPA past-practice process because: (1) integration of cleanup is required by the TPA to prevent duplication of work and to economically and effectively address contamination, (2) applicable standards would not be circumvented by coordination, (3) Ecology would not lose authority over coordination, (4) protection of human health and the environment would not be jeopardized by coordination, (5) the approach is legally defensible, and (6) there is no evidence of and limited potential for soil or groundwater contamination from TSD activities at the 324 Building. This coordination of cleanup activities is described in Chapter 7.0, Section 7.5 and Chapter 8.0, Section 8.3.

Section 6.3.1 of the Tri-Party Agreement states, "Any demonstration for clean closure of a disposal unit, or selected treatment or storage units as determined by the lead regulatory agency, must include documentation that groundwater and soils have not been adversely impacted by that TSD group/unit, as described in WAC 173-303-645 (Ecology, et al., 1996)." The 324 Building housed mixed waste in the REC, HLV, and LLV; however, it is believed that none of this dangerous waste escaped the 324 Building to reach the soil or groundwater. If closure of the soil and groundwater cannot be accomplished as described in Chapter 7.0, surveillance and maintenance requirements will be established (as described in Chapter 8.0) prior to coordination of final cleanup with the TPA past-practice operable unit.

Best Available Copy

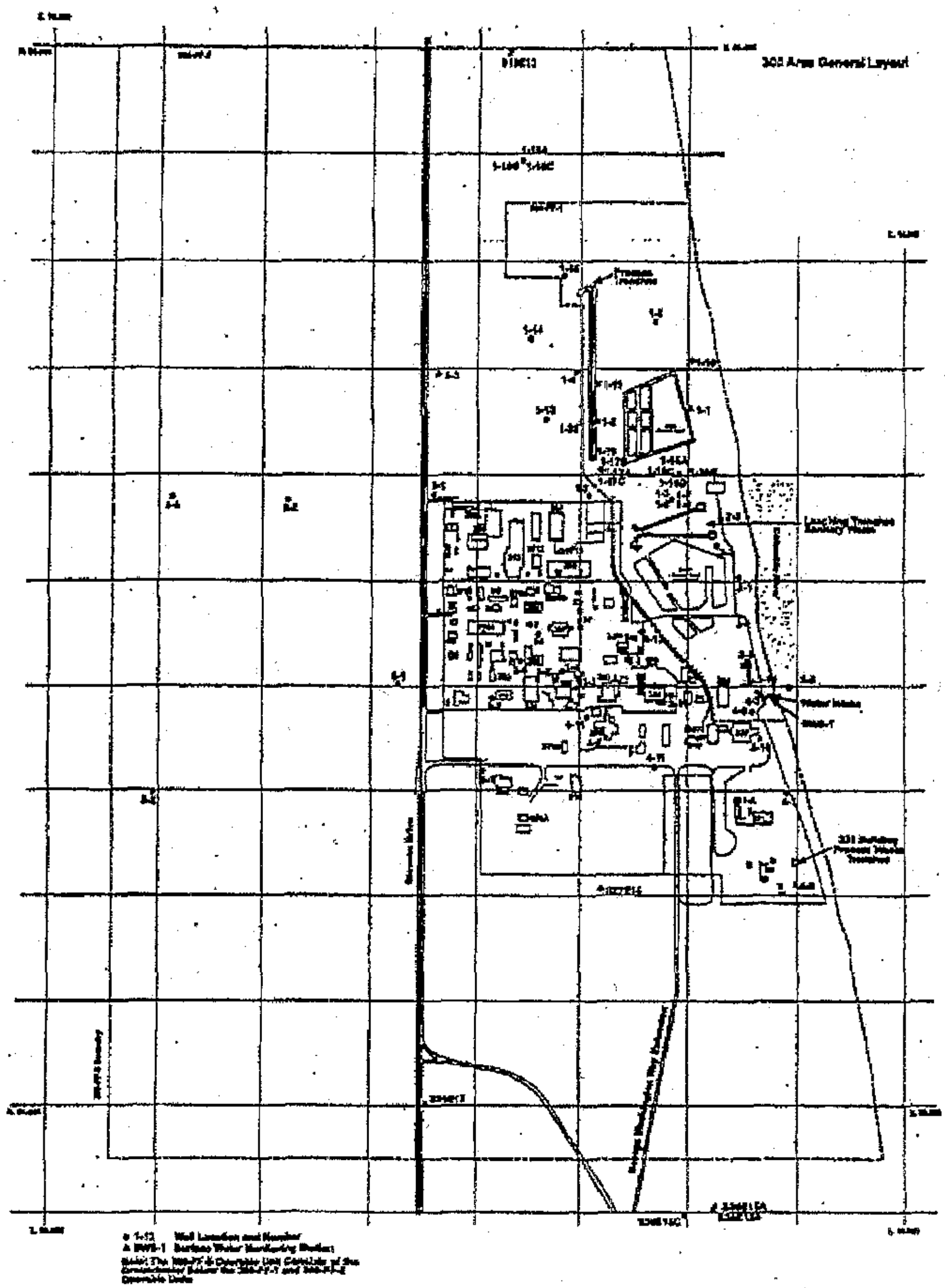


Figure 5-1. 300 Area General Lay Out, Location of Operable Units, Facilities, Groundwater Monitoring Wells, and Areas in which there may be a Source of Uranium Upgradient (groundwater) of the Well 399-3-11.

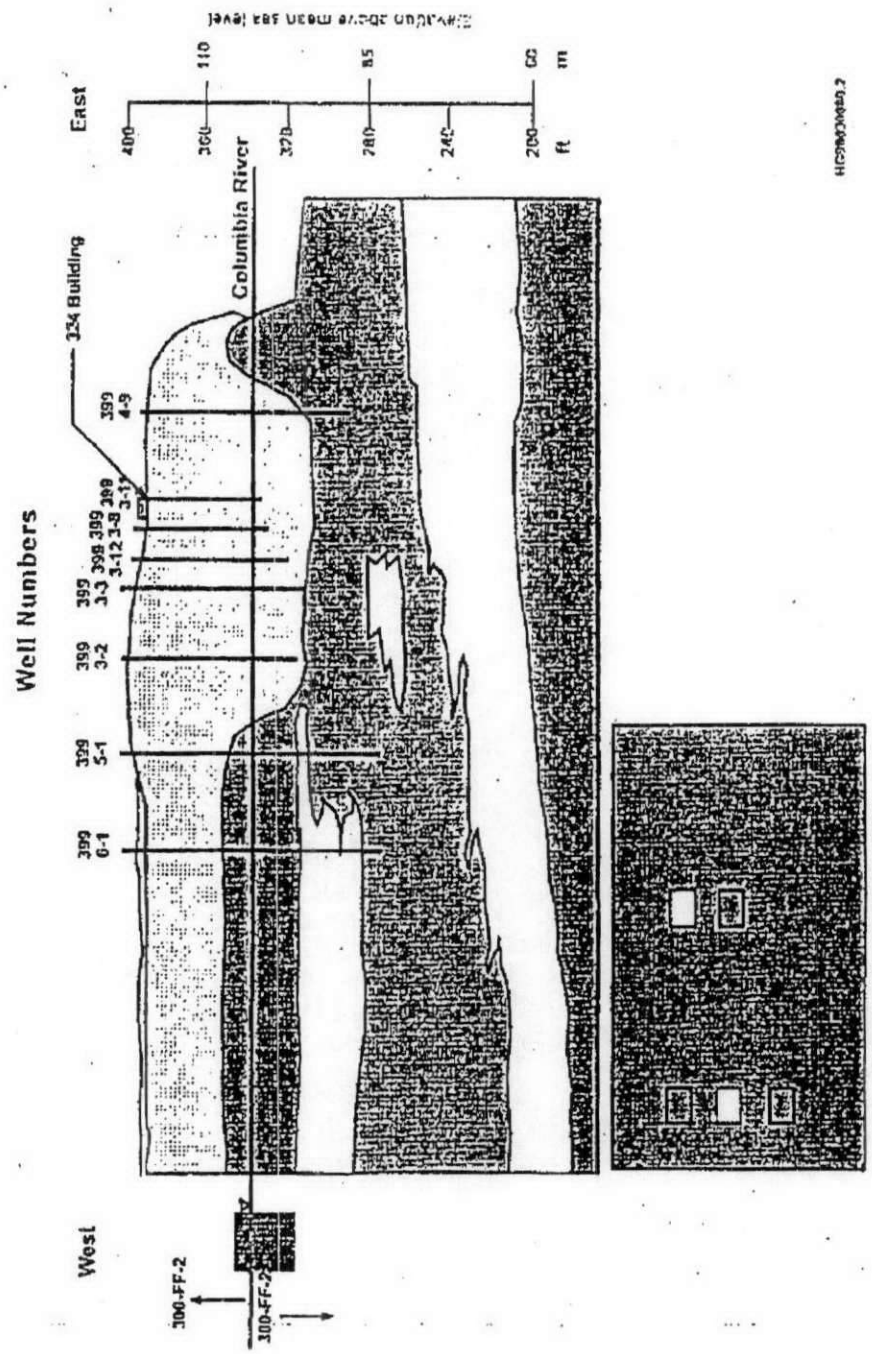


Figure 5-2. Subsurface Cross-Section of the 300 Area.

Best Available Copy

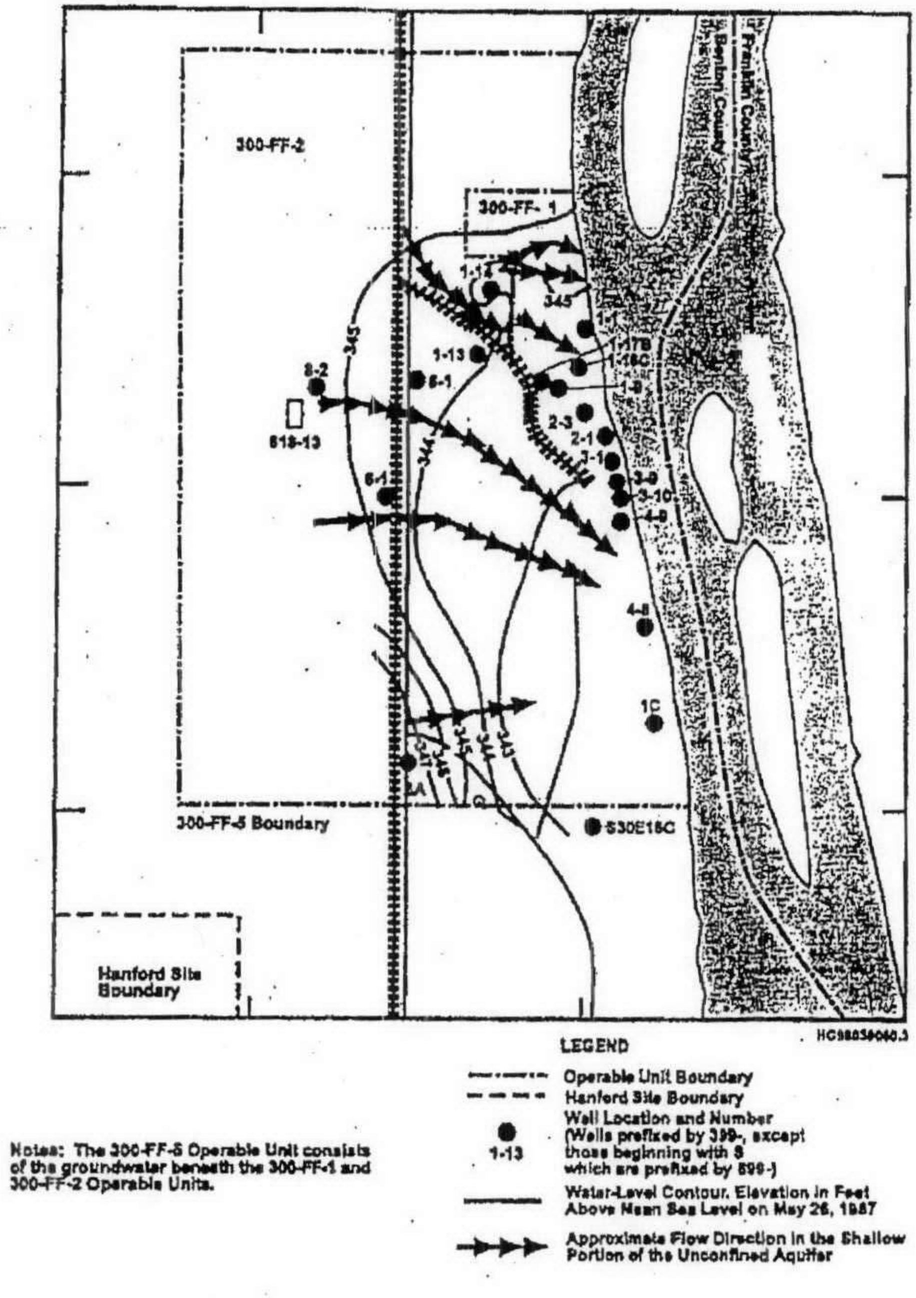


Figure 5-3. Water-Table Elevation-Contour Map of 300 Richland Areas, June 1996.

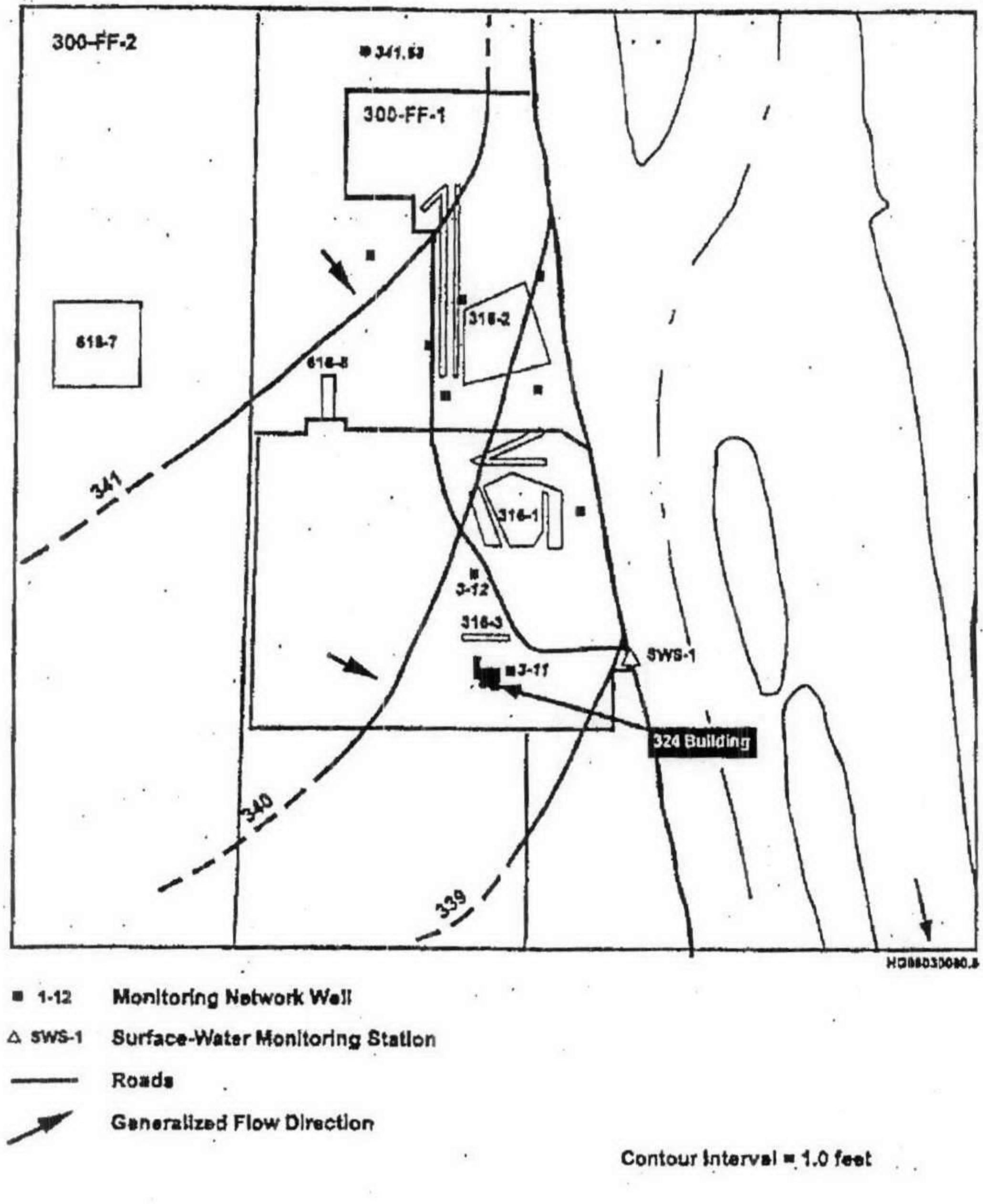


Figure 5-4. General Groundwater Flow Direction in the Unconfined Aquifer of the 300 Area (Normal River Stage, September 27, 1993).

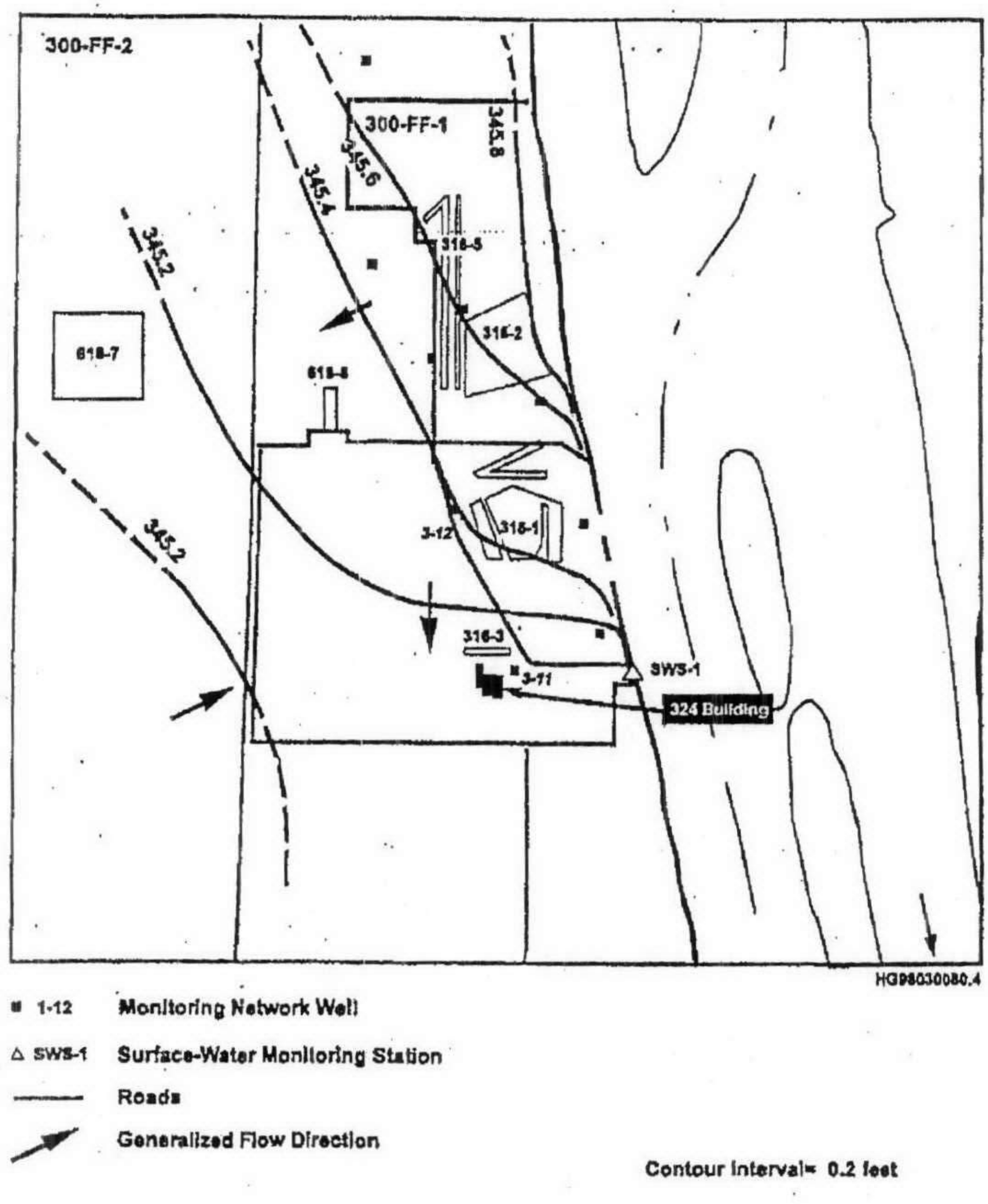


Figure 5-5. General Groundwater Flow Direction in the Unconfined Aquifer of the 300 Area (High River Stage, May 26, 1993).

Best Available Copy

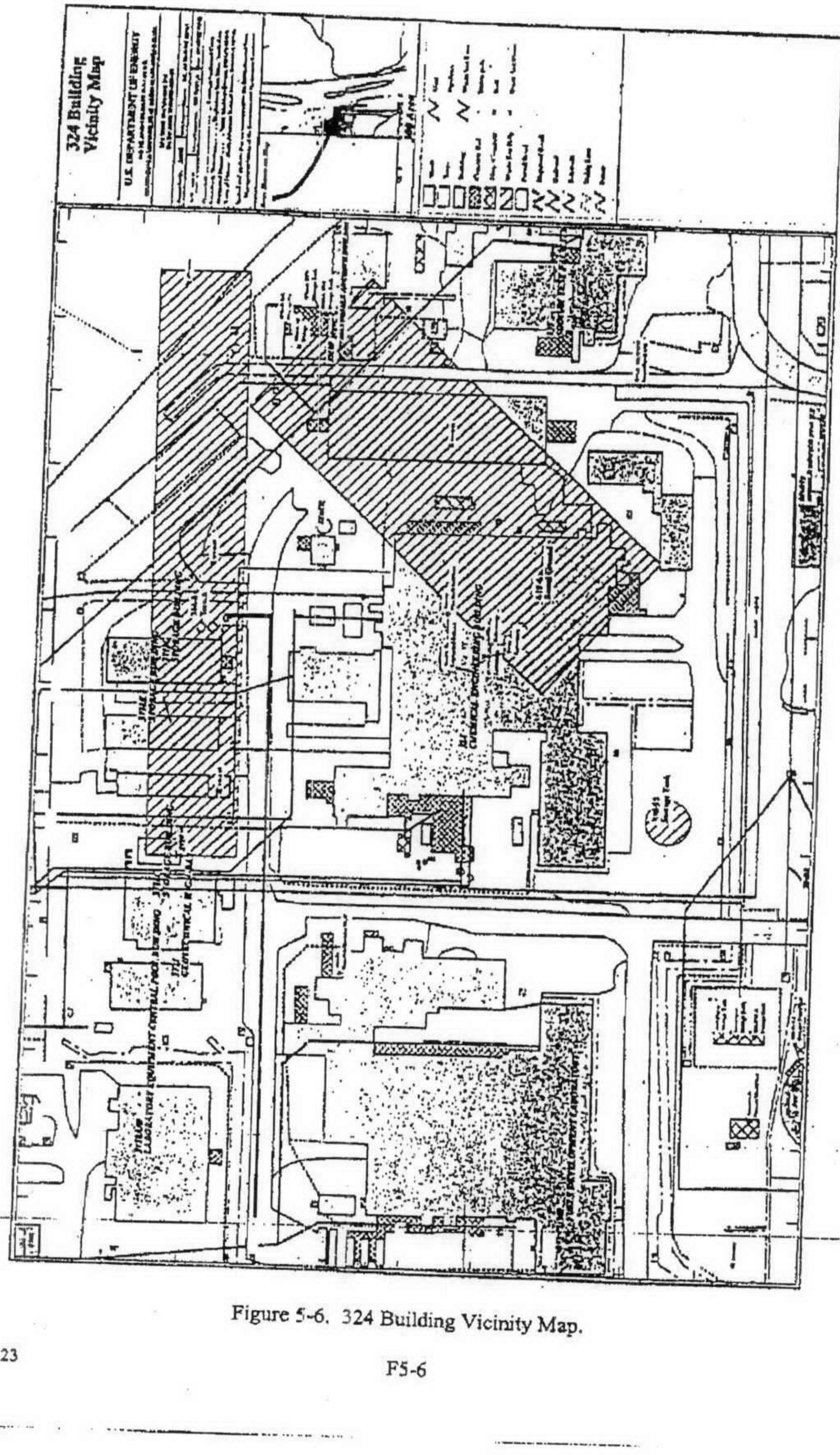


Figure 5-6. 324 Building Vicinity Map.

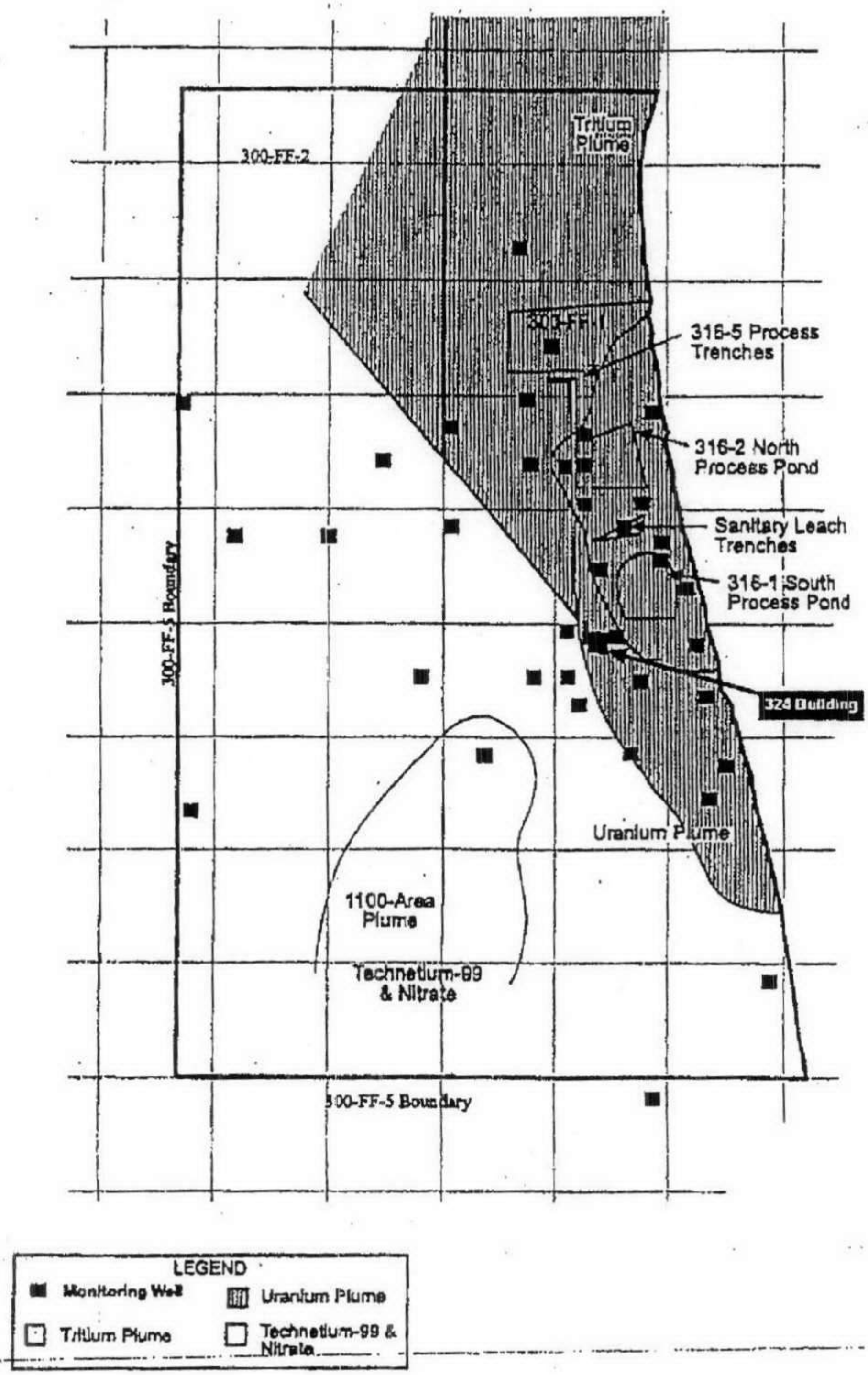


Figure 5-7. Existing Contaminant Plumes in the Vicinity of the 324 Building.

This page intentionally left blank.

Table 5-1. Wells Within 305 Meters of the 324 Building.

Well	Function
399-3-1	Site surveillance
399-3-2	Site surveillance
399-3-3	Site surveillance
399-3-4	No data
399-3-6	Site surveillance
399-3-7	Site surveillance
399-3-8	Site surveillance
399-3-9	Site surveillance
399-3-10	Site surveillance
399-3-11	Site surveillance
399-3-12	CERCLA
399-4-1	CERCLA
399-4-2	No data
399-4-3	No data
399-4-5	Site surveillance
399-4-9	CERCLA
399-4-10	Site surveillance
399-4-11	Site surveillance

Table 5-2. RCRA Groundwater Monitoring Wells in the 300 Area.

Well	Function*
399-1-10A	RCRA
399-1-10B	RCRA
399-1-16A	RCRA
399-1-16B	RCRA
399-1-17A	RCRA
399-1-17B	RCRA
399-1-18A	RCRA
399-1-18B	RCRA

*RCRA wells were installed to support monitoring for the 300 Area Process Trenches

This page intentionally left blank.

CONTENTS

FIGURES

TABLE

This page intentionally left blank.

6.0 CLOSURE STRATEGY AND PERFORMANCE STANDARDS

This chapter discusses the closure strategy and performance standards that will be used to close the 324 REC HLV/LLV.

As addressed in Section 1.3.2, Milestone M-094-03 requires complete disposition of the 324 Building, and the closure strategy and closure performance standard has changed to "removal" of the mixed waste unit components instead of cleaning to meet the Debris Rule "clean debris surface" standard for clean closure. All dangerous and/or mixed waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during closure activities will be handled in accordance with all applicable requirements of WAC 173-303. Because of the complexity and significant radiological contamination of the 324 Building closure unit, closure actions will be closely integrated with the overall facility deactivation and disposition activities. This integration process is described in Chapter 1.0, Section 1.5. The approach illustrated in Chapter 7.0 provides a mechanism for quickly and efficiently addressing issues as they arise during the implementation of closure activities, to minimize the overall impact to the closure schedule. This approach to contingency planning may lead to amending the closure plan and is discussed in greater detail in Chapter 7.0, Section 7.8. This approach provides a proactive method for identifying, evaluating, and acting on necessary changes that could affect closure activities. Such changes could occur, based on changing site conditions that affect personnel protection and safety, nuclear safety, waste generation rates, and/or technology limitations or advances. These changing site conditions will become apparent as work progresses and individual closure actions are accomplished.

6.1 CLOSURE STRATEGY

Closure actions described in the following sections will involve the storage and treatment of dangerous waste during the waste removal and decontamination steps. After the areas within the 324 Building have been closed, these areas will no longer be used for treatment and storage of dangerous waste. However, these areas may be used as necessary to support deactivation activities. These potential future uses could include nondangerous waste activities and generator status dangerous waste activities.

After final building disposition, the appearance of the land where the 324 Building is located will be consistent with the appearance and future use of the surrounding land areas. Milestone M-094-03 (addressed in Chapter 1, Section 1.3.2) requires the complete disposition of the 324 Building. Future land use decisions will be considered during the 324 Building decommissioning process. The final disposition of the building and the appearance and use of the land areas will be integrated with the surrounding 300 Area.

The closure performance standards and closure activities for each of the closure areas and components are described in the following sections. Table 6-1 provides a summary of these standards and actions for each closure area. Table 6-1 reflects the effect of Milestone M-094-03, which requires the complete disposition of the 324 Building and has consequently changed the closure strategy and closure performance standard to "removal" of the mixed waste unit components instead of cleaning to meet the Debris Rule "clean debris surface" standard. All dangerous and/or mixed waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during closure activities will be handled in accordance with all applicable requirements of WAC 173-303. The closure actions are depicted in the closure strategy flow diagrams (Figure 6-1 through Figure 6-3). Figure 6-1 provides the closure strategy for the areas in which nonpermitted TSD operations occurred. Figure 6-2 provides the closure strategy for the piping systems associated with the TSD operations and the support areas.

Clean closure will be achieved by removal of the TSD portions of the 324 Building, as described in this closure plan. However where clean closure is not possible, closure surveillance and maintenance activities will be implemented according to Chapter 8.0 of this closure plan. Completion of facility disposition is defined by TPA Change Number M-094-01-01 as the completion of deactivation, decontamination, and decommissioning (including demolition), and including obtaining EPA and/or Ecology approval of the appropriate project closeout documents. Surveillance and maintenance will be performed as required to maintain safe operations during facility deactivation and removal per Chapter 8.0. The portions of the 324 Building comprising the closure unit include the REC (B-Cell, D-Cell, airlock, pipe trench, cell cubicles, and pass-through ports); HLV and tanks; LLV and tanks; piping; and associated building areas (HLV sample room, EDL-146, truck lock, cask handling area, galleries, and Room 18).

Future actions for building areas outside the closure unit boundary (as defined in Chapter 2.0) or within the boundary (with respect to contamination that was not a result of use of these areas for treatment or storage of dangerous waste) are outside the scope of this closure plan and will be performed as part of the building deactivation and disposition process. Components which meet the closure requirements but may have residual radiological contamination (e.g., liners, embedded piping, structures, etc.) will be formally dispositioned during building deactivation and final building removal. All dangerous and/or mixed/waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

After the waste inventory and equipment are removed, closure of the REC, HLV and LLV, piping, and associated areas will be accomplished by removal activities integrated with facility disposition activities as outlined in the closure plan.

The closure of this unit will be completed by removing the liners, tanks, and piping that contained or handled the dangerous waste contaminants addressed in this closure plan. Closure activities will include removal of soil to a depth of 0.5 m under the TSD unit footprint. Closure activities are not to be compromised or otherwise circumvented due to integration with other remedial activities. All noncompliances or deviations from actions specified in the Closure Plan are to be reported to Ecology. Applicable or relevant and appropriate requirements will be developed for TSD closure activities conducted in conjunction with CERCLA remedial actions, and are subject to review and approval by Ecology. Any CERCLA actions are subject to review and approval by EPA. Closure activities including those performed in conjunction with CERCLA activities will be approved by Ecology.

This chapter discusses the strategy for closure of the 324 REC/HLV. However, if a change in strategy occurs before closure is completed and is agreed to and approved by Ecology, the closure plan will be revised and the new strategy will be employed and documented as described in Chapter 7.0, Section 7.8.

6.2 CLOSURE PERFORMANCE STANDARDS

Closure, as provided for in this plan, will be conducted in accordance with WAC 173-303-610. For all structures, equipment, bases, liners, etc., clean closure standards are set by Ecology on a case-by-case basis in accordance with the closure performance standards of WAC 173-303-610(2) and in a manner that minimizes or eliminates postclosure escape of dangerous waste constituents. Closure performance standards require the owner or operator to close the building in a manner that: minimizes the need for further maintenance; controls, minimizes, or eliminates (to the extent necessary to protect human health and the environment) postclosure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere; and return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity. Closure performance standards for the actions proposed for each of the areas and components identified in the closure boundary are provided in the succeeding sections.

The closure standards will be "removal" for cell liners and concrete. The closure of this unit will be completed by removing the liners, tanks, and piping components that contained and/or handled the dangerous waste contaminants addressed in this closure plan. All dangerous and/or mixed-waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

Closure performance standards for various components are discussed in the following sections.

6.2.1 Radiochemical Engineering Cells

The closure strategy for the REC Cells is provided in a logic flow diagram (Figure 6-1). Removal activities may include alternative methologies (e.g., grouting and removal of monolithic structures). The sequence of activities may be worked in sequence different than presented in the following.

6.2.1.1 A-Cell

A-Cell was not used for TSD activities; therefore, there are no specific closure activities required. However, piping between B-Cell and the HLV tanks passes under A-Cell in a crawl space and piping will be removed or isolated as described in Section 6.2.3.

6.2.1.2 B-Cell

Components requiring closure within B-Cell include the cell contents (excess equipment, debris, and dispersibles), liner, and concrete. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

- All dangerous and mixed waste inventory will be removed.

- All in-cell excess equipment was removed, designated, and disposed as part of Tri-Party Agreement Milestone M-89-02.

- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303

- The liner and concrete will be removed

- The closure of this unit will be completed by removing the liners, tanks, and piping that contained and/or handled the dangerous waste contaminants addressed in this closure plan. Closure activities will include removal of soil to a depth of 0.5 m under the TSD unit footprint.

6.2.1.3 C-Cell

C-Cell was not used for the TSD activities; therefore there are no specific closure activities required.

6.2.1.4 D-Cell

General closure activities for the REC D-Cell will be as follows:

- Remove, designate, and dispose of all HLV clean-out equipment, associated utilities, and residual waste (after the equipment and materials are no longer being used to support the closure and deactivation activities).

- Remove liner and concrete. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.1.5 Airlock

The closure component for the airlock is the dangerous waste piping. Dangerous waste piping will be closed by performing removal of the piping.

6.2.1.6 Pipe Trench

Components requiring closure within the pipe trench include the piping in the trench, any potentially mixed waste debris in the trench, and the concrete. The following closure activities must be performed to close the pipe trench.

- All debris and sludge will be removed, designated and disposed.

- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.1.7 Other Radiochemical Engineering Cell Components

Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.2 High-Level Vault and Low-Level Vault

The tanks within the HLV and LLV will be removed and disposed, and the vault liners will be removed. Because of the high-radiation levels associated with the tanks, alternative removal methods and/or closure actions may be required. Chapter 7.0 provides a process for contingency planning that will be used to deal with changing conditions as they develop. The closure of this unit will be completed by removing the liners, tanks, and piping that contained and/or handled the dangerous waste contaminants addressed in this closure plan.

The HLV tanks will be removed. The LLV and tanks may remain operational, as necessary, to support closure deactivation activities, and then will be removed and disposed to achieve closure, consistent with the closure strategy for the HLV and LLV in Figure 6-1. The vault liners will be removed.

6.2.2.1 High-Level Vault

Components requiring closure within the HLV include the vault contents (tanks, ancillary equipment, piping, and residual wastes), the liner, and potentially the concrete. Following are the closure activities for the HLV:

- Any remaining dangerous and mixed waste inventory (i.e., tank heels) will be removed. The mixed waste tank liquid inventory that was removed in 1996 as part of the 324 HLV interim waste removal action is described in Chapter 3.0, Section 3.3.1.5.

- The tanks and ancillary equipment will be removed and size reduced as necessary; designated as waste; and disposed at an appropriate waste management and/or TSD unit.

- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

- The liner will be removed, designated, and disposed. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

- Walls and floor of the vault will be removed.

6.2.2.2 Low-Level Vault

Components requiring closure within the LLV include the vault contents (tanks, ancillary equipment, piping, and residual waste), the liner, and the concrete. The closure activities planned for the LLV are the same as those required for the HLV (Section 6.2.2.1).

6.2.2.3 Sample Room (Room 145)

Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.3 Piping Systems

Components requiring closure within the piping system include all piping runs used to carry dangerous wastes between the REC Cells and vault tanks. The closure strategy for the piping system is provided in Figure 6-2. Following are the closure activities for the piping system:

- Identify piping that could have transported dangerous waste. Only piping that transported dangerous waste to or from an area within the closure boundary is within the scope of this closure plan.

- The closure process will include removal of all piping. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4 Other 324 Building Areas within the Closure Boundary

General closure activities for the miscellaneous associated building areas will be to remove all piping runs that were used to carry dangerous waste between the REC Cells and vault tanks. The closure strategy for piping is removal. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.1 Cask Handling Area

The cask handling area was not used for TSD activities; therefore there are no specific closure activities required.

6.2.4.2 Truck Lock

The closure component for the Truck Lock is the dangerous waste piping. Dangerous waste piping will be closed by removal in accordance with the closure plan standards. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.3 Engineering Department Laboratory-146

The closure component for the EDL-146 is the dangerous waste piping. Dangerous waste piping will be closed by removal in accordance with the closure plan standards discussed in Section 6.2.3. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.4 Operating Galleries

The closure component for the galleries is the dangerous waste piping. Dangerous waste piping will be closed by removal in accordance with the closure plan standards discussed in Section 6.2.3. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.5 Room 18

The closure components for Room 18 are the dangerous waste piping and the potential concrete surrounding the B-Cell service plugs. General closure activities for Room 18 will be as follows:

- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

- Remove concrete in the same manner as B-Cell.

6.2.5 Underlying Soils and Groundwater

Soil and groundwater contamination existed prior to the operations of the 324 Building TSD unit. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing soil and groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

This page intentionally left blank.

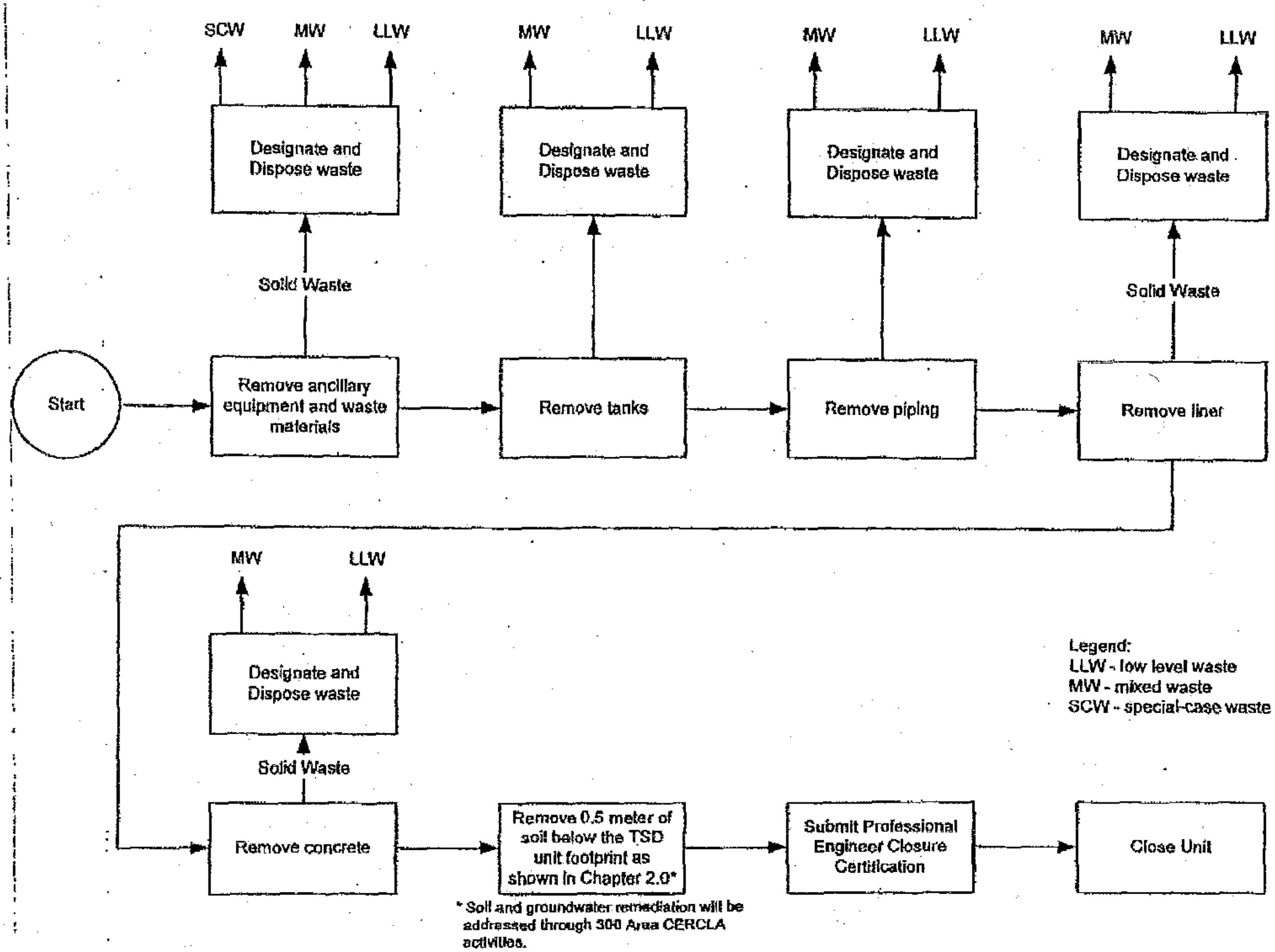


Figure 6-1. Closure Strategy Flowchart for B-Cell, D-Cell, Pipe Trench, High-Level Vault and Low-Level Vault.

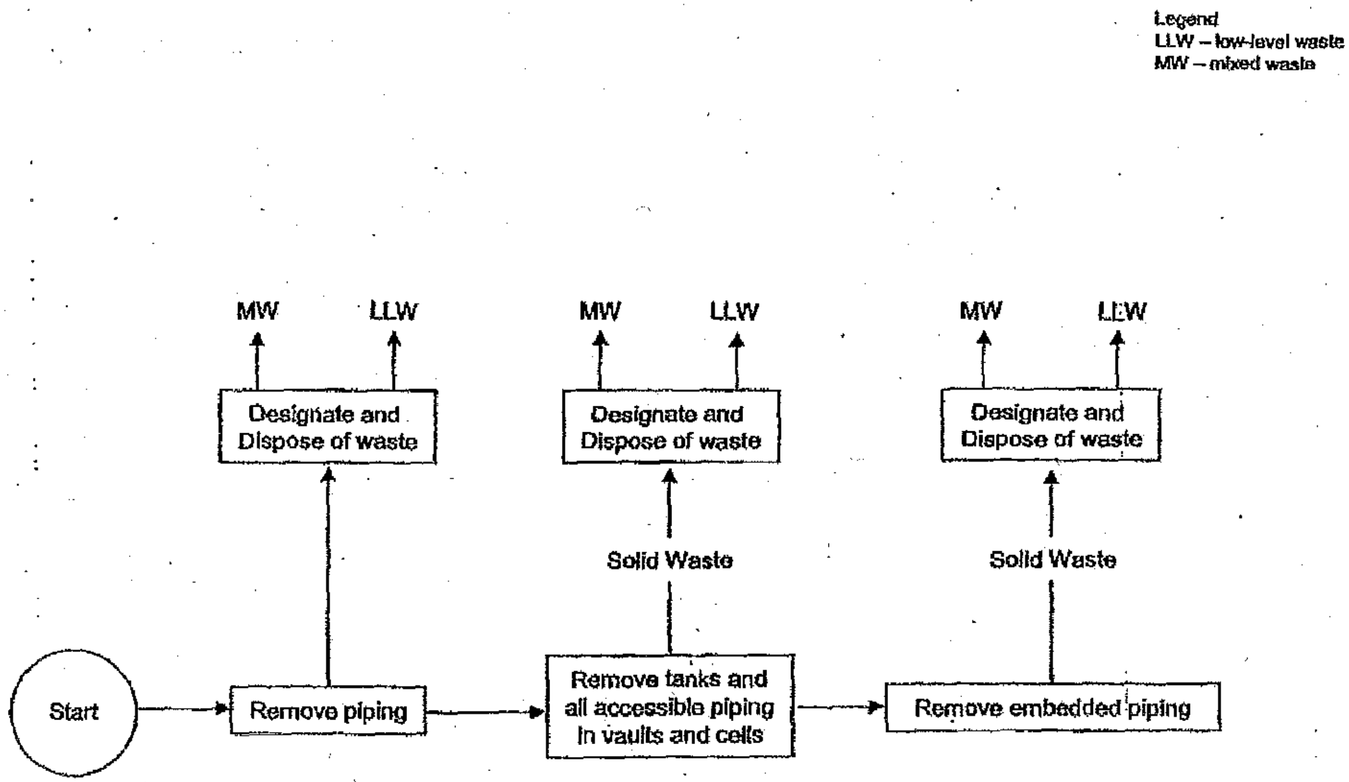


Figure 6-2. Closure Strategy Flowchart for Dangerous Waste Piping.

Table 6-1. Closure Performance Standards and Activities for Areas Undergoing Closure.

Area	Components	Closure Performance Standard	Closure Activities*
A-Cell	No closure activities required.	• Piping removal (under A-Cell). • Piping in place (embedded in walls) will be removed	Note: • HLV piping in A-Cell crawl space will be removed. • Closure of soil in the crawlspace below the piping is covered under Soil/Groundwater.
B-Cell	Cell contents (excess equipment, debris, and dispersibles), liner, and concrete	• Removal of all mixed waste and excess equipment • Remove Liner Note: HLV piping in B-Cell will be removed Soil under B-Cell is covered under Soils/Groundwater	• In-cell excess equipment, debris, and dispersibles (including all mixed waste) will be removed • Remove liner and concrete
C-Cell	No closure activities required.	Not Applicable	Not Applicable
D-Cell	Waste container storage area; HLV liquid treatment process equipment area	• Removal of all mixed waste and equipment (Chapter 3.0, Section 3.3) • Remove Note: HLV piping in D-Cell will be removed Soil under D-Cell is covered under Soil/Groundwater.	• Document visual inspection of waste container storage area. • Document visual inspection of equipment area. • Remove all equipment following any use during closure activities. • Remove liner and concrete.
Airlock	Piping from HLV	• Remove piping. Note: HLV piping in the airlock will be removed.	• Remove all piping
Pipe trench	Piping from HLV	• Remove piping. • Removal of all mixed waste (if present) Note: HLV piping in the Pipe Trench will be removed. Soil under the pipe trench is covered under Soils/Groundwater.	• Remove all piping • Remove all waste/debris • Remove pipe trench and concrete Note: In-cell debris will be designated and disposed of appropriately as either mixed waste or low-level waste.

Table 6-1. Closure Performance Standards and Activities for Areas Undergoing Closure.

Area	Components	Closure Performance Standard	Closure Activities*
Other REC components	Piping from HLV	• Remove piping. Note: HLV piping in the cell cubicles and pass-through ports will be removed.	• Remove all piping
HLV	Four tanks, piping, liner, concrete	• Removal of all mixed waste and equipment • Remove liner Note: HLV piping will be removed. Soil under HLV is covered under Soil/Groundwater.	• Tank heels, ancillary equipment, and the tanks will be removed • Remove vault liner and concrete
LLV	Four tanks, piping, liner, concrete	• Removal of all potential mixed waste and equipment • Remove tanks, piping, liner, and concrete. Note: Low-level vault (LLV) piping will be removed. Soil under the LLV is covered under Soil/Groundwater.	• Tank heels, ancillary equipment, and the tanks will be removed • Remove tanks, piping, liner, and concrete
HLV sample room (room 145)	Piping from HLV and LLV	• Remove piping. Note: HLV piping in the HLV sample room will be removed.	• Remove all piping
Piping systems	Piping from REC Cells and the HLV and LLV	• Remove all piping • Remove pipe runs	• Remove all piping
Cask handling area	None	Not Applicable	Not Applicable
Truck lock	None	Not Applicable	Not Applicable
EDL-146	Piping from HLV and LLV	• Remove piping. Note: HLV/LLV piping in EDL-146 will be removed.	• Remove all piping
Galleries	Piping from HLV and LLV	• Remove piping. Note: HLV piping in the HLV sample room will be removed.	• Remove all piping
Room 18	Piping from HLV/LLV and potentially contaminated concrete	• Remove HLV/LLV piping and contaminated concrete in Room 18.	• Remove contaminated concrete • Remove piping

Table 6-1. Closure Performance Standards and Activities for Areas Undergoing Closure.

Area	Components	Closure Performance Standard	Closure Activities*
Soil/Groundwater	Potentially contaminated soil	• Localized soil removal.	• Remove soil to a depth of 0.5 meter under the TSD unit footprint.

* Detailed description of the closure actions and activities are included in Chapter 7.0.

* Closure of components will be achieved through removal. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

This page intentionally left blank.

CONTENTS

CONTENTS (cont)

APPENDIX

FIGURES

TABLE

7.0 CLOSURE ACTIVITIES

Closure will be pursued for the TSD portions of the 324 Building. As addressed in Chapter 6.0 and presented in Table 6-1, the closure strategy and closure performance standard has changed to "removal". If closure to the planned closure performance standards is not attainable, closure surveillance and maintenance will be implemented in accordance with Chapter 8.0. This chapter discusses the activities that are necessary to implement this closure strategy. Figure 7-1 provides the approach for dealing with changing site conditions, including potential contingency plans.

Waste removal activities conducted, in accordance with the consent order of M-89-01 and M-89-02, are described in Chapter 3.0.

All work will be performed to maintain personnel exposure to dangerous and/or mixed waste, radioactivity, hazardous chemicals, or any other workplace hazard ALARA. Some work activities will be performed remotely because of ALARA concerns. Detailed records, including daily log books, and in some activities video logs, will be maintained for closure actions, including waste removal and management activities, component decontamination, and all other activities proceeding to closure of the unit.

Because of the complexity and significant radiological contamination of the 324 Building TSD unit, closure actions will be closely integrated with the overall deactivation and disposition activities. This integration process is described in detail in Chapter 1.0, Section 1.5. The approach, illustrated in Chapter 7.0, provides a mechanism during the implementation of closure activities to quickly and efficiently address issues as they arise, thereby minimizing the overall impact to the closure schedule. This approach to contingency planning could lead to amending the closure plan discussed in greater detail in Section 7.7. This approach provides a proactive method for identifying, evaluating, and acting on necessary changes that could affect closure activities. Such changes could occur, based on changing site conditions that affect personnel protection and safety, nuclear safety, waste generation rates, and/or technology limitations or advances. These changing site conditions will become apparent as work progresses and individual closure actions are accomplished.

Documentation of closure activities will include an independent professional engineer or equivalent certificate of completion. Closure activities will be documented in a formal manner using operations logbooks or equivalent documentation consistent with supporting the required professional engineering certification and documentation of closure activities. Per WAC 173-303-380 (Facility recordkeeping), the facility operating record documentation will include records and results of waste analyses and waste determinations. Per WAC 173-303-610(6), documentation supporting the independent registered professional engineer's certification of closure of the mixed waste units must be furnished to Ecology upon request. Closure activities documentation (e.g., logbooks and documentation referenced in logbooks, inspection checklists, videos, and photographs) shall be protected and maintained until final closure is obtained. All documentation supporting closure shall be protected and maintained in retrievable storage through completion of closure of the 324 Building REC mixed waste units and as applicable for post-closure. Copies of this documentation will be made available to Ecology upon request. Any sampling and analysis plans generated as a result of this closure plan will be included or referenced.

~~7.1 CLOSURE ACTIVITIES FOR RADIOCHEMICAL ENGINEERING CELLS~~

The REC consists of the A-Cell, B-Cell, C-Cell, D-Cell, the airlock, the pipe trench, and the cell cubicles and pass-through ports. Closure of B-Cell, D-Cell, and the pipe trench will entail removal, as indicated in

Chapter 6.0, Table 6-1. The airlock, cell cubicles, and pass-through ports will be closed by removing dangerous waste pipes from the HLV. A-Cell and C-Cell were not used for TSD activities, and therefore, no closure activities are identified for these areas.

7.1.1 Closure Activities for A-Cell

A-Cell was not used for TSD activities; therefore, there are no specific closure activities identified for A-Cell in this closure plan.

7.1.2 Closure Activities for B-Cell

B-Cell Closure Activities include, (1) Removal of equipment and radiological contaminated dispersible debris in B-Cell (completed through Tri-Party Agreement M-89-02 activities), (2) B-Cell cleaning (decontamination as necessary to remove residual material), and (3) removal of the liner and concrete. Waste will be designated and managed as described in Section 7.6. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

7.1.2.1 B-Cell Equipment and Waste Removal

The B-Cell waste removal activities (completed through M-89-02 activities) included removing and disposing of the equipment and racks within B-Cell, including handling equipment, such as cell bridge cranes and in-cell ends of the manipulators; and solid waste collection vessels, such as 208-liter waste containers; Tank 119, and engineered containers. Equipment and racks were rinsed as appropriate to remove dispersible material, size reduced, and loaded into steel liners. Some material required special handling because of anticipated high dose rates.

After equipment racks were removed, the potentially dispersible material on the floor was collected and containerized. This material, which was considered mixed waste and special-case waste, was sampled, characterized, and removed from B-Cell to an appropriate TSD unit.

Closure of dangerous waste issues associated with B-Cell required removal of materials and equipment from B-Cell. Most of the material and equipment in the cell, with the exception of process auxiliary tanks and piping systems, were not dangerous waste or dangerous waste components. Effective mitigation of dangerous waste hazards in B-Cell depended upon completion of the waste removal activities.

7.1.2.2 B-Cell Cleaning

The closure strategy (Chapter 6.0, Table 6-1) for B-Cell involves the removal of mixed waste, equipment, and the liner and surrounding concrete. Some cleaning may be performed for waste management or radiological work management reasons associated with 324 Building deactivation and disposition. There are four primary cleaning methods that could be used to clean the surface of B-Cell: (1) wet wipe down of walls and floors, (2) dry alkaline foam wash, (3) water wash and hot spot cleaning, and (4) oxidation coating removal using chemical extraction processes. Some cleaning may be performed due to dose rate reduction, waste packaging, or facility demolition/engineering considerations. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303. Each method or process could be used more than once or discontinued if proven ineffective. In addition, other methods (such as abrasive blasting or high pressure steam and water sprays) also might be considered if shown to be advantageous from an effectiveness, personnel protection, or waste minimization standpoint. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

7.1.2.3 B-Cell Floor Liner Removal

Removal of the B-Cell liner will be performed to meet the closure performance standard.

7.1.2.4 Remove B-Cell Liner and Concrete

The liner will be removed, designated, and disposed of in accordance with WAC 173-303.

7.1.2.5 Liquid Waste Handling System (LWHS) Operations in B-Cell

The LWHS may be used as needed in B-Cell for removal of water by evaporation for liquid waste solutions generated from 324 Building REC closure and/or decontamination activities. The system will be located in B-Cell and will handle water solutions and perform drying/evaporation, with collection of solids for waste disposed in waste containers. The LWHS would be operated remotely in B-Cell. Any spills would be documented in an operations logbook or equivalent method. Repairs and/or necessary equipment modification will be documented. The walls, floors, and liners of B-Cell and of the 324 Building provide protection of the environment should any spills occur. When no longer needed to support facility deactivation closure activities, the LWHS equipment will be removed, designated, and disposed.

7.1.3 Closure Activities for C-Cell

C-Cell was not used for TSD activities; therefore, there are no specific closure activities identified for C-Cell in this closure plan.

7.1.4 Closure Activities for D-Cell

Closure activities for D-Cell (Chapter 6.0, Table 6-1) include removal of equipment, waste, piping, liner, and concrete. Closure of D-Cell will include removal of the waste inventory and the equipment used for the processing of the HLV tank liquid waste.

The HLV liquid waste treatment equipment has been emptied and rinsed. The treatment skid has been disassembled. After this equipment is no longer needed to support closure activities, the equipment will be removed from D-Cell and disposed as waste.

7.1.4.1 D-Cell Removal

Closure activities for D-Cell (Chapter 6.0, Table 6-1) include removal of equipment, waste, piping, liner, and concrete.

7.1.4.2 Remove D-Cell Liner and Concrete

The liner and underlying concrete surfaces will be removed.

7.1.5 Closure Activities for the Airlock

The closure activities for the airlock are all associated with the dangerous waste piping. Dangerous waste piping closure activities are addressed under the closure activities for the piping, Section 7.3.

7.1.6 Closure Activities for the Pipe Trench

The pipe trench closure activities include removal of piping, waste/debris, and the pipe trench and concrete. Waste materials generated during these activities will be properly designated and dispostioned at an acceptable waste management facility.

7.1.6.1 Pipe Trench Pipe Removal

As described in Section 6.2.3, the sequence of piping removal will be closely integrated with all closure and deactivation activities so that piping needed to support closure and decontamination operations is left in place until such operations are completed.

Piping will be removed as practicable, designated, and packaged. Embedded piping will be removed.

7.1.6.2 Pipe Trench Initial Cleanout and Decontamination

Sludge and debris in the pipe trench was collected, designated, and transferred to a Hanford Site waste management facility. The pipe trench was decontaminated to remove the bulk of the sludge. Decontamination residues were collected, designated, and managed as described in Section 7.6. Pipe trench residual material or sludge was managed as dangerous waste. The pipe trench will be removed, designated, and packaged.

7.1.7 Closure Activities for other REC Components

The closure activities for the other REC components such as the cell cubicles and pass-through ports are all associated with the dangerous waste piping. Dangerous waste piping closure activities are described in Section 7.3.

7.2 CLOSURE ACTIVITIES FOR THE HIGH-LEVEL VAULT AND LOW-LEVEL VAULT

The HLV and LLV each consist of four tanks, the vault liner and concrete, and the piping and ancillary equipment in the vault. All dangerous and mixed waste inventory will be removed with the HLV tank system. In 1996, the HLV and LLV tanks were emptied and the HLV tanks flushed to satisfy Tri-Party Agreement Milestone M-89-01 (Chapter 3.0, Section 3.3). Closure of the HLV and LLV entails removing the tanks, piping, liner, and concrete. Closure activities for the HLV are described in Section 7.2.1. The LLV and tanks may remain operational, as necessary, to support deactivation and closure activities, and then will be removed and disposed to achieve closure.

7.2.1 Closure Activities for the High-Level Vault

Waste removal and flushing activities that were performed in accordance with the M-89-01 Milestone are described in Chapter 3.0, Section 3.3.9.

7.2.1.1 Tank and Piping Cleaning

If the piping system is to be used during closure activities, piping integrity will be confirmed using pressure tests. The performance standard for the tanks is removal. Residual mixed waste in the tanks and piping systems will be removed with the tank systems. Decontamination waste solutions may processed through a temporary effluent processing system (LWHS, described in Section 7.1.2.5). Solid waste produced will be designated and disposed at an acceptable waste management facility. Waste water will be evaporated using an in-cell system and the collected solid waste appropriately designated and packaged for waste disposal.

7.2.1.2 Tank and Piping Removal

The tanks and piping will be removed, designated, and disposed of accordingly. The following vault contents will be removed to meet closure performance standards and deactivation end-points:

- Accessible piping
- Process tanks
- Remaining piping
- Ventilation ducting
- Pass-through piping.

7.2.1.3 Remove Liner and Concrete

Closure of the TSD unit components will be completed by removing the liners and concrete.

7.2.2 Closure Activities for the Low-Level Vault

The LLV tanks, piping, and liner will be closed in the same manner as the HLV tanks. The following steps will be taken in the same manner as described for the HLV in Section 7.2.1:

- Tank and piping removal
- Removal of the liner and concrete

7.2.3 Closure Activities for the Sample Room (Room 145)

The sample room (Room 145) has piping that connects to the tanks in the HLV and LLV. The piping will be removed as described in Section 7.3.

7.3 CLOSURE ACTIVITIES FOR THE PIPING

Components requiring closure within the piping system include all piping runs that were used to carry dangerous waste constituents between the REC and Vault tanks. Only piping that might have carried dangerous waste constituents will undergo closure activities. These pipes are referred to as 'dangerous waste piping'. However, the piping between the LLV and the Sodium Removal Pilot Plant will be addressed in this closure plan for completeness. The closure strategy for the piping system is provided in a logic flow diagram in Chapter 6.0 (Figure 6-2).

Piping that will undergo closure includes the piping identified in Table 7-1. Table 7-1 identifies all piping associated with the HLV and LLV tanks. This table also identifies which piping requires closure based on their historical use. All other piping will be evaluated during the 324 Building D&D process. Facility deactivation will proceed in parallel with the closure activities as described in Chapter 1.0, Section 1.3. The pipes will be removed. All removed piping will be designated and disposed in accordance with WAC 173-303.

7.3.1 Piping Removal

Piping is to be removed. The closure performance standard will be the removal of all ancillary equipment and piping when that piping is no longer needed to support closure or deactivation activities. Such piping will be removed, designated, and disposed. Piping that is needed to support deactivation or closure activities will be maintained until these closure activities are completed and then removed.

7.3.2 Closure of Embedded Piping

Embedded piping will be removed with the concrete during concrete removal activities.

7.4 CLOSURE ACTIVITIES FOR THE MISCELLANEOUS BUILDING AREAS

Closure of the cask handling area, truck lock, EDL-146, and galleries are described in the following sections. General closure activities for the miscellaneous associated building areas will be to remove all piping runs that were used to carry dangerous waste between the REC and Vault tanks.

7.4.1 Closure Activities for the Cask Handling Area

The cask handling area was not used for TSD activities; therefore, there are no specific closure activities required.

7.4.2 Closure Activities for the Truck Lock

The closure component for the truck lock is the dangerous waste piping. Dangerous waste piping will be closed in accordance with the closure activities discussed in Section 7.3

7.4.3 Closure Activities for the Engineering Laboratory (Room 146)

The closure component for EDL-146 is the dangerous waste piping. Dangerous waste piping will be closed in accordance with the closure activities discussed in Section 7.3.

7.4.4 Closure Activities for the Operating Galleries

The closure component for the galleries is the dangerous waste piping. Dangerous waste piping will be closed in accordance with the closure activities discussed in Section 7.3.

7.4.5 Closure Activities for Room 18

The closure components for Room 18 are the dangerous waste piping and potentially the concrete surrounding the B-Cell service plugs. Dangerous waste piping and service plugs will be removed.

7.5 CLOSURE ACTIVITIES FOR SOIL DIRECTLY BENEATH THE BUILDING

The B-Cell, HLV, and LLV vaults were designed and installed with a system to contain and collect leaks or spills and to channel these to sumps from which the solutions were pumped back into the tank system. The closure of this unit will be completed by removal of TSD unit components. Soil and groundwater contamination existed prior to the operations of the 324 Building. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing soil and groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

7.6 REGULATED MATERIAL REMOVED DURING CLOSURE

Materials that designate as dangerous waste, including decontamination waste, treatment residue, and/or closure debris will be transferred to an onsite approved unit or shipped offsite to a TSD facility. Containers used for transfers of regulated materials to offsite TSD facilities will be U.S. Department of Transportation-approved containers compatible with the waste being transferred (e.g., 208-liter containers). The containers will be labeled and shipped offsite under manifest according to WAC 173-303-180 and WAC 173-303-190 as applicable, or transferred to an onsite approved unit. After designation, waste could be disposed as follows:

- Dangerous waste will be transported offsite or to an onsite unit to await final disposal or treatment.
- Low-level waste will be disposed onsite in the Low-Level Waste Burial Grounds, or the Environmental Restoration Disposal Facility (ERDF), or other acceptable facility, as applicable, and consistent with disposal facility waste acceptance criteria.
- Solid mixed waste will be transferred to the Central Waste Complex, the PUREX Storage Tunnels, or to another permitted TSD Unit. (The PUREX Storage Tunnels were used in the past.)
- Closure strategy is to dry liquid mixed waste using LWHS in B-Cell to remove water by evaporation and to collect solids for disposal transfer to CWC.
- Nondangerous and nonradioactive solid waste could be disposed offsite.

age 188 of 299 of DA0524uv

7.7 SCHEDULE FOR CLOSURE

The closure schedule is presented in Appendix 7A of this closure plan. Removal of inventory from B-Cell, D-Cell, and the HLV already has been completed in accordance with the Tri-Party Agreement milestones M-89-01 and M-89-02 and is reflected in the closure schedule provided in Appendix 7A. Because of the complexity and significant radiological contamination of the 324 Building, the schedule proposed for completion of M-89-00 is greater than 180 days. Closure of the 324 Building mixed waste unit is scheduled to be completed by September 30, 2010.

7.8 AMENDMENT OF CLOSURE PLAN (CONTINGENCY PLANNING)

If an amendment to the approved closure plan is required at any time before the notification of partial or final closure, RL will submit a written request to Ecology asking for authorization to change the approved plan. The written request will include a copy of the closure plan amendment and will be submitted in accordance with WAC 173-303-610(3).

Because of the complexity and significant high levels of radiological contamination of the 324 Building, an approach has been developed to manage uncertainties and unknowns during closure activities. Figure 7-1 provides a flow diagram illustrating this process. If unexpected conditions are encountered that potentially impact personnel safety (including radiological contamination, high-dose-rate areas, or industrial safety issues), nuclear safety (including safeguards and security of materials), secondary waste generation, or environmental protection, or in areas in which technology limitations exist, a change in approach might be warranted.

The initial step involves evaluating the condition to determine if a change to the planned closure activities exists. If a potential change is warranted, the problem scope and boundary conditions will be defined and a focused alternative analysis/feasibility study will be conducted to develop a defensible path forward. The results of the study will be used to evaluate if the closure performance standards can still be met and to determine if there are significant cost and schedule impacts. If possible, closure actions will continue per the approved closure plan. However, if the performance standards cannot be met, or if the cost and schedule impacts are such that rescoping of closure activities are necessary, new closure actions will be developed and the closure plan amended and submitted to Ecology for approval.

7.9 CERTIFICATION OF CLOSURE

In accordance with WAC 173-303-610 (6), within 60 days of completing the closure activities, the RL will submit a certification of closure to Ecology. The certification will be signed by the RL, the site contractor, and an independent professional engineer registered in the State of Washington. Certification will state that the areas have been closed in accordance with the approved closure plan (Figure 7-2). The certification will be submitted by registered mail. Documentation that supports the closure certification by the independent registered professional engineer also will be submitted to Ecology with the certification for closure.

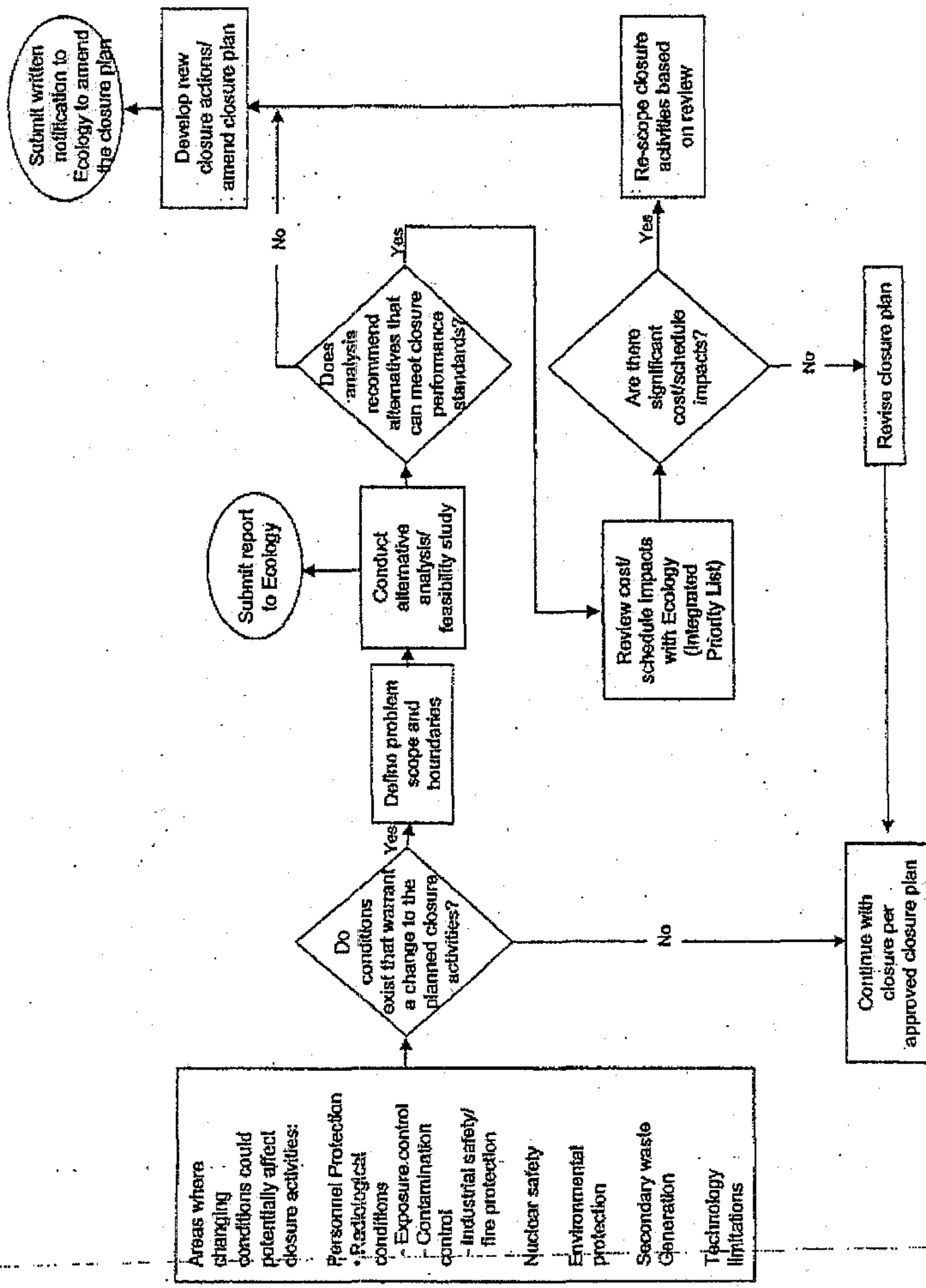


Figure 7-1. Closure Strategy for Dealing with Changing and/or Unknown Conditions (Contingency Planning).

CLOSURE CERTIFICATION
FOR

Hanford Site
U.S. Department of Energy, Richland Operations Office

We, the undersigned, hereby certify that all ____________________ closure activities were performed in accordance with the specifications in the approved closure plan.

____ __________
Owner/Operator Signature RL Representative (Typed Name) Date

____ __________
Contractor Representative (Typed Name) Date

____________________________ P.E.# __________ State
Signature Independent Registered Professional Engineer Date
(Typed Name, Washington State Professional Engineer license number, and date of signature)

Figure 7-2. Typical Closure Certification Document.

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
1" MP-1-02	CH	Jet 02	Steam for TK 101(D) to Pot	LLV	No	Concrete	No
1" MP-2-03	CH	Jet 03	Steam for TK 102(A) to Pot	LLV	No	Concrete	No
1" MP-3-04	CH	Jet 04	Steam for TK 103(C) to Pot	LLV	No	Concrete	No
1" MP-3-05	CH	Jet 05	Steam for TK 103(D) to Pot	LLV	No	Concrete	No
1" MP-4-06	CH	Jet 06	Steam for TK 104(D) to Pot	HLV	No	Concrete	No
1" MP-4-07	CH	Jet 07	Steam for TK 104(E) to Pot	HLV	No	Concrete	No
1" MP-5-08	CH	Jet 08	Steam for TK 105(D) to Pot	HLV	No	Concrete	No
1" MP-5-09	CH	Jet 09	Steam for TK 105(E) to Pot	HLV	No	Concrete	No
1" MP-6-10	CH	Jet 10	Steam for TK 106(F) to Pot	HLV	No	Concrete	No
1" MP-6-11	CH	Jet 11	Steam for TK 106(J) to Pot	HLV	No	Concrete	No
1" MP-HLV-12	CH	Jet 12	Jet 12 for draining HLVS via 1" PT-29	HLV	No	Concrete	No
1" MP-LLV-13	CH	Jet 13	Jet 13 for draining LLVS via 1" PT-30	LLV	No	Concrete	No
1" MP-1-16	CH	Jet 16	Steam for TK 101(L) to 1" TK101-Jet-CBWS	LLV	No	Concrete	No
1" MP-2-17	CH	Jet 17	Steam for TK 102(P) to 1" TK102-Jet-CBWS	LLV	No	Concrete	No
1" MP-4-18	CH	Jet 18	TK 104 Spray Jet	HLV	No	Concrete	No
1" MP-5-19	CH	Jet 19	TK 105 Spray Jet	HLV	No	Concrete	No
1" MP-6-20	CH	Jet 20	TK 106 Spray Jet	HLV	No	Concrete	No
½" CA-3-21	CH	TK 103(R)	Air Lift	LLV	No	Concrete	No
½" CA-6-22	CH	HLV	Service to Vent Breather	HLV	No	Concrete	No
1" CA-1-23	CH	TK 101(J)	Sparger	LLV	No	Concrete	No
1" CA-2-24	CH	TK 102(G)	Sparger	LLV	No	Concrete	No
1" CA-3-25	CH	TK 103(J)	Sparger	LLV	No	Concrete	No
1" CA-4-26	CH	TK 104	Sparger	HLV	No	Concrete	No
1" CA-5-27	CH	TK 105	Sparger	HLV	No	Concrete	No
1" CA-6-28	CH	TK 106	Sparger	HLV	No	Concrete	No
1" PT-29	HLVS	PT	HLV Sump to PT via Jet 12	HLV	Yes	Concrete	Yes
1" PT-30	LLVS	PT	LLV Sump to PT via Jet 13	LLV	Yes	Concrete	Yes
1" TPS-1-34	TK 101(S)	LOS	TK 101 Pot to LOS	LLV	Yes	Concrete	Yes

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
1" TPS-2-35	LOS	TK 102(Q)	LOS to TK 102 Pot via J-42	LLV	Yes	Concrete	Yes
1" TPS-3-36	TK 103(T)	LOS	TK 103 Pot to LOS	LLV	Yes	Concrete	Yes
1" TPS-3-37	LOS	TK 103(Q)	Via Jet 43	LLV	Yes	Concrete	Yes
1" TPS-4-38	TK 104	LOS	TK 104 Pot to LOS	HLV	Yes	Concrete	Yes
1" TPS-5-39	LOS	TK 105	LOS to TK 105 Pot via Jet 45	HLV	Yes	Concrete	Yes
1" TPS-6-40	LOS	TK 106	LOS to TK 106 via Jet 46	HLV	Yes	Concrete	Yes
1" TPS-6-41	TK 106	LOS	TK 106 Pot to LOS	HLV	Yes	Concrete	Yes
1" TPS-1-42	PT	TK 101(M)	Dip Leg	LLV	Yes	Concrete	Yes
1" TPS-1-43	TK 108(D)	PT	Process Transfer leg	LLV	Yes	Concrete	Yes
1" TPS-2-44	PT	TK 102(J)	Dip Leg	LLV	Yes	Concrete	Yes
1" TPS-2-45	TK 102(S)	PT	(No Jumper in PT)	LLV	Yes	Concrete	Yes
1" TPS-3-46	PT	TK 103(E)	Dip Leg	LLV	Yes	Concrete	Yes
1" TPS-3-47	TK 103(S)	PT	Dip Leg	LLV	Yes	Concrete	Yes
1" TPS-4-48	PT	HLV	Spare	HLV	Yes	Concrete	Yes
1" TPS-4-49	PT	HLV	Spare	HLV	Yes	Concrete	Yes
1" TPS-5-50	PT	HLV	Spare	HLV	Yes	Concrete	Yes
1" TPS-5-51	PT	HLV	Spare	HLV	Yes	Concrete	Yes
1" TPS-6-52	PT	HLV	Spare	HLV	Yes	Concrete	Yes
1" TPS-6-53	PT	TK 106	Air Sweep	HLV	Yes	Concrete	Yes
2" TPS-1-54	A-11,21,31 A-12,22,32 B-12, B-14	TK 101(E)	Cubicle drains Header to TK 101	LLV	Yes	Concrete	Yes
2" TPS-1-55	EDL-146	TPS-1-56	EDL-146	LLV	Yes	Concrete	No
2" TPS-1-56	TPS-1-55	TK 108	Header	LLV	Yes	Concrete	No
1" TPS-1-57	A-31	TPS-1-54	A-Cell Cubicle Drain To TK 101	LLV	Yes	Concrete	No
1" TPS-1-58	A-11	TPS-1-54	A-Cell Cubicle Drain To TK 101	LLV	Yes	Concrete	No
1" TPS-1-59	A-21	TPS-1-57	A-Cell Cubicle Drain To TK 101	LLV	Yes	Concrete	No
1" TPS-1-61	B-14	TPS-1-54	B-Cell Cubicle Drain to TK 101	LLV	Yes	Concrete	No

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
1" TPS-1-62	A-11, A-12 B-12, B-14 C-11, C-12 D-21, D-22	TK 101(B)	Header to TK 101	LLV	Yes	Concrete	Yes
1" TPS-1-63	LOS	TK 101(A)	via Jet	LLV	Yes	Concrete	Yes
1" TPS-1-64	A-11	TPS-1-62	A-Cell to TK 101 via Header	LLV	Yes	Concrete	No
1" TPS-1-65	D-21, D-22	TPS-1-62	D-Cell to TK 101 via Header	LLV	Yes	Concrete	No
1" TPS-1-66	C-11, C-12	TPS-1-65	C-Cell to TK 101 via Header	LLV	Yes	Concrete	No
1" TPS-1-67	B-14	TPS-1-62	B-Cell to TK 101 Header	LLV	Yes	Concrete	No
2" TPS-2-68	A-11, A-12 B-12, B-14 C-11, C-12 D-21, D-22	TK 102(B)	Header to TK 102	LLV	Yes	Within Vault	Yes
2" TPS-2-69	TPS-2-70	TK 102(E)	Header to TK 102	LLV	Yes	Concrete	No
2" TPS-2-70	EDL-146	TPS-2-69	EDL-146	LLV	Yes	Concrete	No
1" TPS-2-72	A-11	TPS-2-68	A-Cell to TK 102 via Header	LLV	Yes	Concrete	No
1" TPS-2-73	D-21, D-22	TPS-2-68	D-Cell to TK 102	LLV	Yes	Concrete	No
1" TPS-2-74	C-12, C-11	TPS-2-73	C-Cell to TK 102	LLV	Yes	Concrete	No
1" TPS-2-75	B-14	TPS-2-68	B-Cell to TK 102	LLV	Yes	Concrete	No
2" TPS-4-76	A-11, A-12 B-12, B-14 C-11, C-12 D-21, D-22	TK 104(A)	Header to TK 104	HLV	Yes	Concrete	Yes
1" TPS-4-77	LOS	TK 104(R)	LOS to TK 104 via Jet 44	HLV	Yes	Concrete	Yes
1" TPS-4-78	A-11	TPS-4-76	A-Cell to TK 104	HLV	Yes	Concrete	No
1" TPS-4-79	D-21, D-22	TPS-4-76	D-Cell to TK 104	HLV	Yes	Concrete	No
1" TPS-4-80	C-11, C-12	TPS-4-79	C-Cell to TK 104	HLV	Yes	Concrete	No
1" TPS-4-81	B-14	TPS-4-76	B-Cell to TK 104	HLV	Yes	Concrete	No
1" TPS-5-82	A-11, A-12 B-12, B-14 Airlock	TK 105(A)	Header to TK 105	HLV	Yes	Concrete	Yes
1" TPS-5-83	A-11	TPS-5-82	A-Cell to TK 105	HLV	Yes	Concrete	No
1" TPS-5-84	B-14	TPS-5-82	B-Cell to TK 105	HLV	Yes	Concrete	No
1" TPS-5-85	Air Lock	TPS-5-82	Air Lock to TK 105	HLV	Yes	Concrete	No
1" TPS-6-86	C-11, C-12	TK 106(A)	(Dip Leg)	HLV	Yes	Concrete	Yes

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
1" TPS-6-87	B-12, B-14	TK 106(M)	Header B-Cell to TK 106	HLV	Yes	Concrete	Yes
½" TPS-3-117	TK 103	EDL-146	Air Lift	LLV	Yes	Concrete	No
½" TPS-6-118	PT	TK 106	Spare	HLV	Yes	Concrete	Yes
1" TPS-1-119	Rm 11	TK 101	SMF	LLV	Yes	Concrete	No
1" TPS-146	Spl Trench	TK 101	Sample Trench Drain	LLV	Yes	Concrete	No
1" RW-5-147	CH	TK 105	Jacket Water In	HLV	No	Concrete	No
1" RW-6-148	CH	TK 106	Jacket Water In	HLV	No	Concrete	No
1" PT-149	LLC	PT	Process Transfer	LLV	Yes	Concrete	Yes
1" TPS-5-155	PT	TK 105	B-Cell Sump Transfer Line	HLV	Yes	Sleeve	No
1" TPS-4-156	PT	TK 104	PT Sump Transfer Line	HLV	Yes	Sleeve	No
1" TPS-7-157	PT	TK 107	PT Sump Transfer Line	HLV	Yes	Sleeve	No
1" TPS-1-175	B-12	TPS-1-54	B-12 Cubicle Drain to TK 101	LLV	Yes	Concrete	No
1" TPS-1-176	B-12	TPS-1-62	B-Cell to 101	LLV	Yes	Concrete	No
1" TPS-2-177	B-12	TPS-2-68	B-Cell to TK 102	LLV	Yes	Concrete	No
1" TPS-2-178	B-12	TPS-4-76	B-Cell to 104 Drain	HLV	Yes	Concrete	No
1" TPS-5-179	B-12	TPS-5-82	B-Cell to TK 105	HLV	Yes	Concrete	No
1" TPS-1-186	A-32	TPS-1-57	CD to TK 101	LLV	Yes	Concrete	No
1" TPS-1-187	A-22	TPS-1-57	CD to TK 101	LLV	Yes	Concrete	No
1" TPS-1-188	A-12	TPS-1-54	CD to TK 101	LLV	Yes	Concrete	No
1" TPS-1-189	A-12	TPS-1-62	A-Cell to TK 101	LLV	Yes	Concrete	No
1" TPS-2-190	A-12	TPS-2-68	A-Cell to TK 102	LLV	Yes	Concrete	No
1" TPS-4-191	A-12	TPS-4-76	A-Cell to TK 104	HLV	Yes	Concrete	No
1" TPS-5-192	A-12	TPS-5-82	A-Cell to TK 105	HLV	Yes	Concrete	No
1" TPS-7-207	TK 107	LOS	TK 107 Pot to LOS	HLV	Yes	Concrete	Yes
1" TPS-7-209	LOS	TK 107	via Jet 47	HLV	Yes	Concrete	Yes
1" TPS-7-215	PT	HLV	Spare	HLV	Yes	Concrete	Yes
1" TPS-7-216	PT	TK 107	Air Sweep	HLV	Yes	Concrete	Yes
½" CH-HLV-268	CH	HLV	MP to J-29	HLV	Yes	Concrete	No
½" CH-HLV-269	CH	HLV	MP to J-40-107 to Pot	HLV	Yes	Concrete	No

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
½" CH-HLV-270	CH	HLV	T402	HLV	Yes	Concrete	No
½" CH-HLV-271	CH	HLV	Inst Line T401	HLV	Yes	Concrete	No
½" CH-HLV-272	CH	HLV	TE107-1	HLV	Yes	Concrete	No
½" CH-HLV-273	CH	HLV	Inst Line T403	HLV	Yes	Concrete	No
1" CH-LLV-274	CH	LLV	MP to LLVS J-37 LLVS to TK 102	LLV	Yes	Concrete	No
1" CH-LLV-275	CH	LLV	2 Radiation Elements	LLV	Yes	Concrete	No
1" CH-LLV-276	CH	LLV	To RPS Header	LLV	Yes	Concrete	No
1" CH-LLV-277	CH	LLV	Spare	LLV	No	Concrete	No
1" CH-LLV-278	CH	LLV	Spare	LLV	No	Concrete	No
1" CH-LLV-279	CH	LLV	Spare	LLV	No	Concrete	No
1" CH-HLV-280	CH	LLV	Radiation Element	LLV	No	Concrete	No
1" CH-HLV-281	CH	HLV	Spare	HLV	No	Concrete	No
1" CH-HLV-282	CH	HLV	Spare	HLV	No	Concrete	No
1" CH-HLV-283	CH	HLV	RW to TK 104 Jacket	HLV	No	Concrete	No
1" CH-HLV-284	CH	TK 107	MP to TK 107 Internal Jacket	HLV	No	Concrete	No
1" CH-HLV-285	CH	TK 107	RW to TK 107 Jacket	HLV	No	Concrete	No
1" CH-HLV-286	CH	TK 107	RW to TK 107 Coil	HLV	No	Concrete	No
1" CH-HLV-287	CH	TK 107	CH to TK 107 Sparger	HLV	No	Concrete	No
½" CH-HLV-288	CH	TK 107	Chem Add to TK 107	HLV	Yes	Concrete	No
½" CH-HLV-289	CH	HLV	MP to Jet 31 105 to 104	HLV	Yes	Concrete	No
½" CH-HLV-290	CH	HLV	MP to Jet 28 107(B) to 104(A)	HLV	Yes	Concrete	No
½" CH-HLV-291	CH	HLV	MP to Jet 36 (HLVS) to 104	HLV	Yes	Concrete	No
½" CH-HLV-292	CH	HLV	MP to Jet 54 104 to 105	HLV	Yes	Concrete	No
½" CH-HLV-293	CH	HLV	MP to Jet 39 107 to Pot	HLV	Yes	Concrete	No
½" CH-HLV-294	CH	HLV	TE 107-2 TK 107 Temp	HLV	Yes	Concrete	No
½" CH-HLV-295	CH	HLV	Spare	HLV	Yes	Concrete	No
½" CH-HLV-296	CH	HLV	MP to Jet 49 106 to 105	HLV	Yes	Concrete	No
½" CH-HLV-297	CH	HLV	MP to Jet 30 106 to 107	HLV	Yes	Concrete	No
½" CH-HLV-298	CH	HLV	Spare	HLV	Yes	Concrete	No

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
½" CH-HLV-299	CH	HLV	2 Radiation Elements	HLV	Yes	Concrete	No
1" CH-HLV-300	CH	HLV	Spare	HLV	Yes	Concrete	No
1" CH-HLV-301	CH	HLV	Spare	HLV	Yes	Concrete	No
1" CH-HLV-302	CH	HLV	Spare	HLV	Yes	Concrete	No
1" RS-LLV-303	RS	VV-109	Jet Station Vent T into VV-109	LLV	Yes	Concrete	No
1" RS-LLV-304	RS	LLV	To 101 Nozzle A	LLV	Yes	Concrete	No
½" RS-LLV-305	RS	LLV	Flush LIne to VV-106	LLV	Yes	Concrete	No
½" RS-LLV-306	RS	LLV	MP to J-34 102 to 104	LLV	Yes	Concrete	No
½" RS-LLV-307	RS	LLV	MP to J-33 103 to 101	LLV	Yes	Concrete	No
½" RS-LLV-308	RS	LLV	MP to J-32 103 to 102	LLV	Yes	Concrete	No
½" RS-LLV-309	RS	LLV	MP to J-35 101 to 102	LLV	Yes	Concrete	No
½" RS-LLV-310	RS	LLV	MP to J-62 108 to 101	LLV	Yes	Concrete	No
½" RS-LLV-311	RS	LLV	TB 108	LLV	No	Concrete	No
½" RS-LLV-312	RS	LLV	MP to J-56 108 to 102	LLV	Yes	Concrete	No
1" RS-LLV-313	RS	LLV	Spare	LLV	No	Concrete	No
1" RS-LLV-314	RS	LLV	Air to TK 108	LLV	No	Concrete	No
1" RS-LLV-315	RS	LLV	Dip Tube to TK 108	LLV	Yes	Concrete	No
1" RS-LLV-316	RS	LLV	WF & SPG TK 108	LLV	Yes	Concrete	No
1" RS-LLV-317	RS	LLV	RW to E 105	LLV	No	Concrete	No
1" RS-LLV-318	RS	LLV	RW to E 103	LLV	No	Concrete	No
1" RS-LLV-319	RS	LLV	RW to E 101	LLV	No	Concrete	No
1" HLV-LLV-320	HLV	LLV	Spare	LLV	No	Concrete	No
1" HLV-LLV-321	HLV	LLV	Spare	LLV	No	Concrete	No
1" HLV-LLV-322	HLV	LLV	Spare	LLV	No	Concrete	No
1" HLV-LLV-323	HLV	LLV	Spare	LLV	No	Concrete	No
1" HLV-LLV-324	TK 102(N)	TK 104	Via Jet 34	LLV	Yes	Concrete	No
1" HLV-LLV-325	TK 102	TK 104	E 101, E102, E103, CNDs to TK-104	LLV	Yes	Concrete	No
½" CH-LLV-326	CH	TK 104	Decont'n to E 105	LLV	Yes	Concrete	No
½" CH-LLV-327	CH	TK 104	Decont'n to E 103	LLV	Yes	Concrete	No

Table 7-1. HLV and LLV Piping that will Undergo Closure or Deactivation.

Line No.	From	To	Function	H/L	Include in Closure	Routing	Crawlspace
½" CH-LLV-328	CH	TK 104	Decont'n to E 101	LLV	Yes	Concrete	No
1" TPS-7-329	PT	TK 107	TK 107 Pot	HLV	Yes	Sleeve	No
1" TPS-5-330	PT	TK 105	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-4-331	PT	TK 104	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-6-332	PT	TK 106	TK 106 Pot	HLV	Yes	Sleeve	No
½" TPS-6-333	PT	TK 106	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-7-334	PT	TK 107	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-5-335	PT	TK 105	TK 105 Pot	HLV	Yes	Sleeve	No
1" TPS-4-336	PT	TK 104	TK 104 Pot	HLV	Yes	Sleeve	No
1" TPS-4-337	PT	TK 104	TK 104 Pot	HLV	Yes	Sleeve	No
1" TPS-4-338	PT	TK 104	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-5-339	PT	TK 105	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-5-340	PT	TK 105	Process Transfer	HLV	Yes	Sleeve	No
1" TPS-6-341	PT	TK 106	Process Transfer	HLV	Yes	Sleeve	No

Legend:

CA	compressed air
CBWS	crib waste sewer
CH	cask handling
HLV	high-level vault
HLVS	high-level vault sump
HP	high pressure steam
J	jet
LLI	liquid level indicator line
LLV	low-level vault
LOS	load out stall
LP	LOS pressure steam (PSI)
PT	pipe trench
RPS	retention process sewer
RW	raw water
S	spare/sample
SGI	specific gravity indicator
TE	temperature element tube
TPS	tank process sewer
VV	vessel vent

This page intentionally left blank.

CONTENTS

FIGURE

Page 200 of 299 of DA0052400

This page intentionally left blank.

8.0 CLOSURE SURVEILLANCE AND MAINTENANCE ACTIVITIES

Closure of the 324 Building REC is being integrated with the 324 Building deactivation and disposition (including D&D activities). The closure strategy is removal of the TSD unit components and removal of the soil to a depth of 0.5 m under the TSD unit footprint. If it is not possible to achieve the closure performance standards, surveillance and maintenance (S&M) actions will be required until building D&D and the final remediation of the associated OU. Figure 8-1 provides a flow diagram illustrating potential closure S&M scenarios and associated closure actions. Contingency plans have been developed for these actions. This chapter is organized as follows:

- Section 8.1 – Following closure, there are a number of administrative activities that must be taken, even if clean closure can be realized. These actions are described in Section 8.1.
- Section 8.2 – If closure performance standards cannot be met for the TSD unit (i.e., tanks, piping, or structure), then additional closure S&M actions would be required. These contingency plans are presented in Section 8.2.
- Section 8.3 – If soil or groundwater is potentially impacted by TSD operations then contingency plans for the cleanup must be implemented. These actions are described in Section 8.3.

If it is determined to leave waste in place following closure (i.e., close as a landfill), a post-closure plan or approved equivalent will be submitted as an amendment of this closure plan that will meet the requirements of WAC 173-303-610 (7) - (11) (Section 8.1.3). However, if it is necessary to maintain the unit components in a stable state for an extended period of time during the closure process (due to coordination with deactivation activities), the S&M activities will be imposed. These S&M activities are described in Section 8.2.

8.1 GENERAL ADMINISTRATIVE ACTIONS

Following completion of the removal and decontamination closure actions a number of administrative steps will be necessary leading up to the D&D of the building and the final remediation of the associated operable unit components.

8.1.1 Hazards Characterization Information

Hazards characterization information will be maintained in accordance with the guidance provided in Section 8.0 of the TPA (Ecology, et al 1996). S&M activities will continue as appropriate during all phases of 324 Building REC closure and facility disposition activities. The following list is maintained as part of the 324 Building operating records and hazards information:

- Essential diagram drawings required to support S&M and D&D
- Chemical and hazardous substance inventory
- Description and photos of hazardous areas
- Final radiological surveys and maps
- Industrial space hazards identified
- Radioactive and mixed waste accumulation areas identified
- Waste characterization data

- Structural and roof studies
- Fire hazard analysis requirements
- Compliance with Hazards Communication, Asbestos Control, and Confined Space Programs.

8.1.2 Building Care, Use, and Security

Due to the complexity and significant radiological contamination of the 324 Building, closure actions will be closely integrated with the overall deactivation and disposition activities. This integration process is described in Chapter 1.0, Section 1.5. S&M actions will be performed until the building and soil (to a depth of 0.5 m under the TSD unit footprint) are removed. The objectives of the S&M are to ensure adequate containment of any contaminants left in place (both dangerous wastes and radiological), to provide physical safety and security controls and maintain the building in a manner that will present no significant risk to human health or the environment until final disposition is complete. This approach is consistent with the requirements in the Tri-Party Agreement, Section 8.0.

S&M activities include the following:

- **Facility Maintenance** - Preventive maintenance activities for any remaining active systems will be performed. In addition, the adequacy of the existing roof will be evaluated periodically (i.e., five year maximum) and will be repaired as necessary.

- **Facility Surveillance** - Routine (i.e., quarterly) walkdowns will be performed to look at general condition and the status of any remaining active systems (e.g., lighting, emergency power, etc.).

- **Radiological Controls** - As part of the routine surveillances, radiological surveys will be performed.

- **Hazards Protection** - Any remaining hazards (i.e., industrial, chemical, radiological) will be confined and actions taken to ensure hazards are mitigated or managed throughout the duration of the S&M phase. The contingent actions required by this closure plan if dangerous waste constituents are left in place are addressed in Sections 8.2 and 8.3.

- **Safeguards and Security** - The 324 Building will be locked at all times with access limited to S&M staff and emergency response personnel. Signs describing entry requirements will be posted at the entry. These actions will ensure the WAC 173-303-610(7) security requirements are met if dangerous waste residuals are also left in place. General security requirements for the persons entering the 300 Area are provided in Chapter 2.0, Section 2.4. These requirements are established by RL, and are reviewed periodically and updated as needed to ensure an appropriate level of protection.

- **Cost and Schedule** - The S&M plan would include cost estimates and schedules to ensure the objective of the program can be fully met until final facility disposition occurs (meeting WAC 173-303-620 requirements).

In addition to the actions described, additional actions are included in Section 8.3, in the event that closure standards are not attainable.

8.1.3 Amendments

If an amendment to the approved closure plan or the contingent post-closure plan is required at any time prior to the notification of partial or final closure, RL will submit a written request to Ecology as described in Chapter 7.0, Section 7.8. If the need for post-closure care beyond what is described in Section 8.3 is identified, an updated post-closure plan will be prepared in accordance with WAC 173-303-610(8) as an amendment to this closure plan.

8.1.4 Land Authority and Deed Notice

If closure is not achieved in accordance with this closure plan, the requirements for notice to local land authority [WAC 173-303-610(9)] and for notice in deed to property [WAC 173-303-610(10)] will be identified as ARAR for the CERCLA operable unit remedial action process. These notices are to ensure a survey plat, deed notations, (or other legal instrument) and final closure/remediation records are prepared and properly submitted.

8.1.5 Certification of Completion

Within 60 days of completing all the closure activities, RL will submit a certification of closure (or post-closure care if applicable) to Ecology, as described in Chapter 7.0, Section 7.9.

8.1.6 Solid Waste Management Unit Reporting

After the closure activities are completed, Waste Identification Data System (WIDS) descriptions of the Solid Waste Management Units (SWMUs) located in the 324 Building will be updated. In order to maintain a current description of the SWMUs, the WIDS descriptions will be updated within 60 days after a change is made to the respective SWMU. Changes made to the SWMUs will include removal (e.g., flushing, emptying, discharging, leaking, etc.) or placement of waste or material in or on the SWMU. In addition, changes made to the SWMUs will include configuration changes such as the movement, removal, or addition of ancillary equipment, container lids, etc. At a minimum, the WIDS information will be taken into consideration prior to initiating any RCRA corrective action on any 324 Building SWMU.

8.2 CLOSURE SURVEILLANCE AND MAINTENANCE SCENARIOS

Figure 8-1 provides a logic flow diagram used for identifying potential closure surveillance requirements for a number of potential closure scenarios. This process provides contingency plans for dealing with those situations where the closure standards cannot be met.

8.2.1 Tanks and Piping

As described in Chapters 6.0 and 7.0, the objective of the closure plan is to remove all mixed waste unit components, including the applicable dangerous waste tanks and associated ancillary equipment and piping. However, if there are tanks or piping runs that cannot be removed to meet the closure standard, actions will be taken to immobilize the residual dangerous and mixed waste contamination. Following these actions, S&M activities will be performed until removal actions occur. As part of the routine inspections and walk downs, the location of these systems or areas will be noted and specific inspections performed to ensure the integrity and status of the areas are being maintained as planned in accordance with this chapter.

In addition, the building roof surveillance also will include the requirements from WAC 173-303-610 and -640(8), to ensure the building itself is being maintained as the containment structure. These requirements include preventing any precipitation from entering the building, as well as ensuring run-on/run-off is directed away from the building and the areas with residual dangerous waste. The roof will undergo periodic maintenance to ensure it meets the containment structure requirements. No preventive maintenance is planned for any of the remaining tanks, piping, or structures during the S&M phase. However, if conditions are identified during the inspections that change the status of these items from the manner they are documented by facility operating records and hazards information (i.e., piping breaks, spread of contamination, etc.), these conditions will be promptly corrected, consistent with the original closure actions.

8.2.2 Building Areas

The objective of the closure plan is to remove all mixed waste unit components, including the REC cells, HLV/LLV tanks and ancillary piping that handled dangerous waste, and the HLV/LLV vaults. This process is described in Chapters 6.0 and 7.0. However, if these standards cannot be attained, actions will be taken, if necessary, to immobilize the residual dangerous waste contamination. Following these actions, S&M activities will be performed prior to removal of these components. These activities are the same as those needed for tanks and piping, as described in Section 8.2.1.

8.2.3 Soil

The closure strategy for soil potentially contaminated with dangerous waste constituents from TSD operations is provided in Chapter 6.0. This closure strategy is based on removing the TSD unit components and removing soil to a depth of 0.5 m under the TSD unit footprint. As indicated in Chapter 6.0, Table 6-1, the performance standard for closure of each component is removal.

8.2.4 Groundwater

A discussion of groundwater is provided in Chapter 5.0. Groundwater contamination existed prior to the operations of the 324 Building. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

8.3 CONTINGENT PLAN FOR SOIL/GROUNDWATER

During the S&M phase, containment of the areas will be met by maintaining the surrounding building roof and structure. In addition, if it is determined to leave waste in place at closure (i.e., close as a landfill), a post-closure plan or approved alternative will be submitted and will meet the requirements of WAC 173-303-610(7) - (11).

Soil and groundwater contamination existed prior to the operations of the 324 Building. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing soil and groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

This page intentionally left blank.

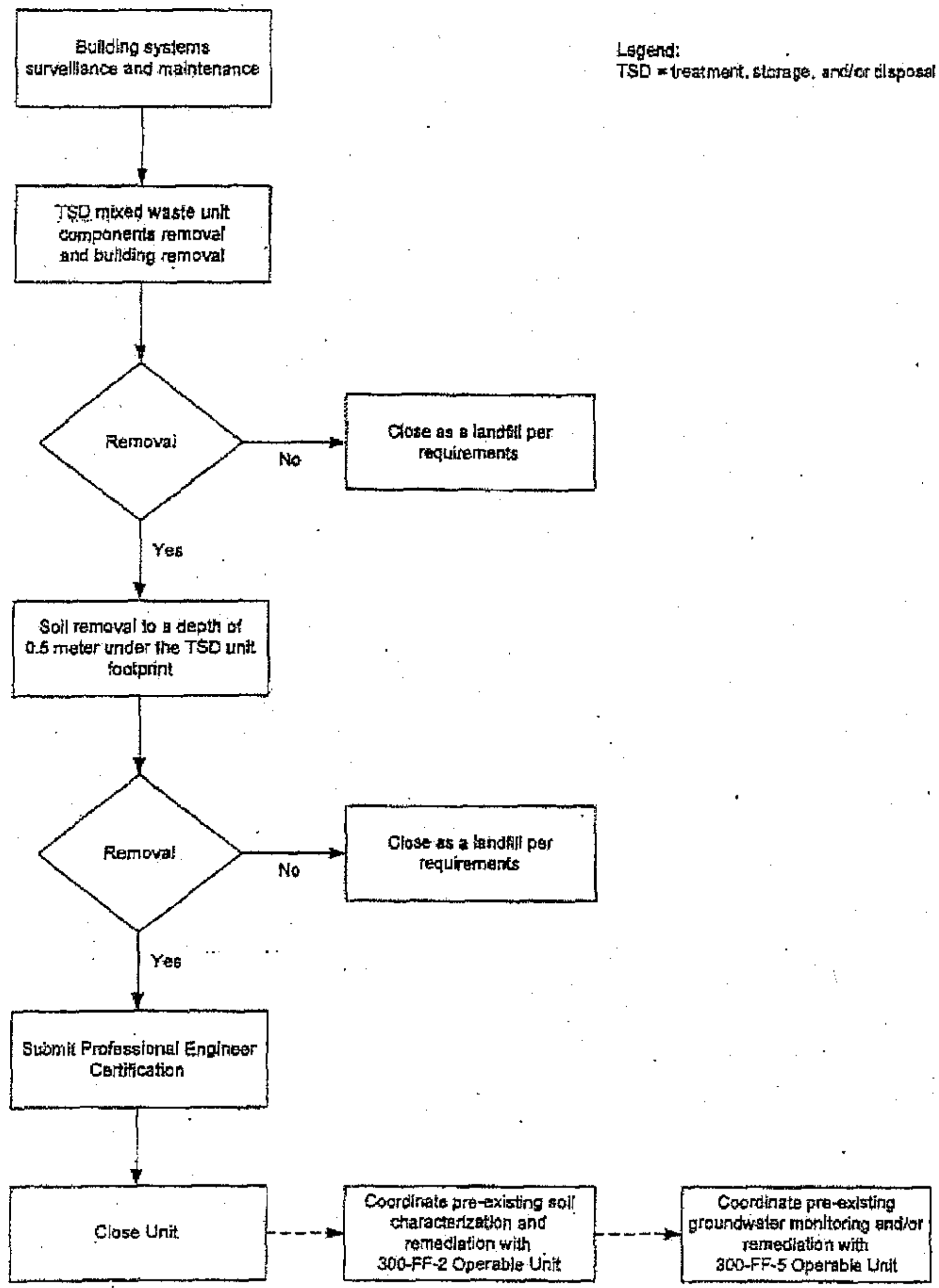


Figure 8-1. Closure Surveillance and Maintenance.

This page intentionally left blank

CONTENTS

This page intentionally left blank.

9.0 REFERENCES

BNWL 1186, *Quarterly Progress Report Research and Development Activities Fixation of Radioactive Residues May, June, and July, 1969*, dated August 1969, Battelle Northwest, Richland, Washington.

DOE Order 4700.1, *Project Management System.*

DOE Order 5480.23, *Nuclear Safety Analysis Reports.*

DOE Order 435.1, *Radioactive Waste Management.*

DOE-STD-1027, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, "Safety Analyses Reports".*

DOE-RL, 1993, Letter from J. D. Bauer to R. F. Stanley, Ecology, and G. C. Hofer, EPA, dated April 30, 1993, "High Activity Radioactive Waste Issues at Hanford," 93-RPA-165, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1997, Letter from D. E. Trader, DOE-RL, to Director Pacific Northwest National Laboratory, dated December 22, 1997, "Contract No. DE-AC06-76RL01830 - Movement of Strontium-90 (Sr-90) Stockpile for Yttrium-90 Generators from Building 324 to Building 325", 98-STP-133, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2002, Amendment to DOE/RL-96-73, Revision 1, 324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan, U.S. Department of Energy, Richland Operations Office, Richland, Washington

DOE/RL-89-14, *Draft Remedial Investigation/Feasibility Study Work Plan for the 300-FF-5 Operable Unit, Hanford Site, Richland, Washington*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 1989.

DOE/RL-93-21, *Phase I Remedial Investigation Report for the 300-FF-5 Operable Unit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 1993.

DOE/RL-94-85, *The 300-FF-5 Operable Units Remedial Investigation/Feasibility Study Report*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 1994.

DOE/RL-96-92, *Hanford Strategic Plan*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-47, Revision 1, May 2004, *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, U.S. Department of Energy, Richland Operations Office, Richland Washington.

DOE/RL/RL-2001-48, Revision 1, May 2004, *300 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, Richland Operations Office, Richland Washington.

Ecology, 1994a, *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit*, Number WA7890008967, revised periodically, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1994b, *Guidance For Clean Closure of Dangerous Waste Facilities*, Publication 94-111, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1994c, *Guidance on Sampling and Data Analysis Methods*, Publication 94-49, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1995a, *Dangerous Waste Compliance Inspection Report 324 Building*, dated February 8, 1995, by Steve Moore, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1995b, Letter from D.L. Lundstrom to J.D. Wagoner, DOE-RL, and W. J. Madia, PNNL, dated February 16, 1995, "Dangerous Waste Compliance Inspection of the 324 Building," Washington State Department of Ecology, Olympia, Washington.

Ecology, 1996, *Hanford Facility Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit*, Permit No. WA7890008967, Part III, Chapter 3, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2002, Letter from F. W. Bond to J. B. Hebdon, DOE-RL, dated December 18, 2002, regarding Amendment to 324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan, Washington State Department of Ecology, Kennewick, Washington.

Ecology, *Statistical Guidance for Ecology Site Managers*

Ecology and DOE-RL, 1997, *Summary of Agreements Reached During the Data Quality Objectives Process: 324 Building*, dated January 10, 1997, Washington State Department of Ecology, Olympia, Washington.

Ecology, EPA, and DOE, 1996, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 1998, *Hanford Federal Facility Agreement and Consent Order,* Change Number M-89-98-03, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 1999, *Hanford Federal Facility Agreement and Consent Order,* Change Number M-89-99-01, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 2001, *Hanford Federal Facility Agreement and Consent Order*, Change Number M-094-01-01, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 2001, *Hanford Federal Facility Agreement and Consent Order*, Change Number M-094-03-01, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 2001, *Hanford Federal Facility Agreement and Consent Order*, Change Number M-094-04-01, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Olympia, Washington.

EPA, *Methods for Evaluating the Attainment of Cleanup Standards-Volume 1; Soils and Solid Media,* EPA 230/02-89-042, 1989, U.S. EPA Office of Policy, Planning and Evaluation, Washington, D.C.

EPA, *Methods for Evaluating the Attainment of Cleanup Standards-Volume 2; Groundwater,* EPA 230-R-92-014, 1992, U.S. EPA Office of Policy, Planning and Evaluation, Washington, D.C.

EPRI-NP-44, *Status of Commercial Nuclear High Level Waste Disposal*, dated September 1976, Electric Power Research Institute, Palo Alto, California.

HNF-5068, Revision 1A, *Project Management Plan for the 300 Area Special-Case Waste*, April 2001, Fluor Hanford, Richland Washington.

HNF-IP-1289, *324/327 Facility Deactivation Project Work Breakdown Structure Dictionaries/Basis of Estimate*, draft, B&W Hanford Company, Richland, Washington.

HWS-230-W, *Standard Specification for Welding Austenitic Steels*, dated March 29, 1982, Rev. 3, Hanford Plant Standards, U.S. Department of Energy, Richland, Washington.

HWS-8227, *Specification for Radiographic Testing of Stainless Steel Weldments*, dated July 14, 1965, General Electric Company, Hanford Atomic Products Operation, Richland, Washington.

Pass, H. J., 1955, *Unconfined Underground Radioactive Waste and Contamination in the 300 Area and Miscellaneous Areas Not Included in Other Reports*, dated September 20, 1955, General Electric Company, Richland, Washington.

PNL-3803, *Technical Summary, Nuclear Waste Vitrification Project*, dated May 1979, Pacific Northwest Laboratory, Richland, Washington.

PNL-10890, *324 Building REC and HLV Tank Closure Plan,* 1995, Pacific Northwest National Laboratory, Richland, Washington.

PNL 1981, *TMI Zeolite Vitrification Demonstration Program Plan*, Pacific Northwest Laboratory, Richland, Washington.

PNL 1990, *Management of Radioactive Liquids Held in the 324 Building*, correspondence from J. L. McElroy, Pacific Northwest Laboratory, to J. J. Sutey, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

PNL 1994, *Designation of High Level Vault Tank Material*, dated April 20, 1994, correspondence from P. J. Weaver, Pacific Northwest Laboratory, to 'File', Richland, Washington.

PNNL-11470, *Hanford Site Groundwater Monitoring for Fiscal Year 1996*, Pacific Northwest National Laboratory, Richland, Washington, 1997.

SAIC, 1993, *Integrity Assessment Plan for PNL 300 Area Radioactive hazardous Waste Tank System,* Final Report, dated July 30, 1993, Science Applications International Corporation, Richland, Washington.

This page intentionally left blank.

APPENDICES

This page intentionally left blank.

APPENDIX 1A

TRI-PARTY AGREEMENT CHANGE NUMBER M-89-94-01

'age 218 of 299 of DA552460

This page intentionally left blank.

Change Number	Federal Facility Agreement and Consent Order Change Control Form	Date
M-89-94-01	Do not use blue ink. Type or print using black ink.	3/13/95

Originator
TPA Negotiation Team Members

Phone
(509) 372-1772

Class of Change
[X] I - Signatories [ ] II - Project Manager [ ] III - Unit Manager

Change Title

Complete closure of non-permitted Mixed Waste (MW) units in the 324 Building Radiochemical Engineering Cell (REC) and High Level Vault (HLV).

Description/Justification of Change

This change package: (1) will result in the establishment of a schedule for closure of non-permitted MW units located in the 324 Building, 300 Area, Hanford site, and (2) represents a proposed compliance action necessary to correct noncompliance with chapter 173-303 WAC and 40 CFR Part 265 as cited in an Ecology voluntary compliance letter transmitted to USDOE and PNL on February 16, 1995. The approach leading to closure includes: 1) achieving compliance with interim status requirements; 2) stabilization of dispersible materials in the REC B-cell; 3) removal of liquid MW in the HLV tanks; and 4) Submittal of a closure plan under milestone M-20-55 and closure of non-permitted MW units in the 324 Building (REC B-cell, REC D-cell, and High Level Vault).

(See Attachment for continuation of Description and proposed milestones)

Impact of Change

This change request establishes a new major milestone, M-89-00, to complete the closure of non-permitted MW units in the 324 Building (REC B cell, D-cell, and HLV). Interim milestones necessary to achieve compliance with interim status standards, stabilization and removal of MW, and closure of non-permitted MW storage units are proposed.

These milestones impact Tri-Party Agreement milestone M-20

Affected Documents

Hanford Federal Facility Agreement and Consent Order, Appendix D

Approvals

This change form approved by Amendment Five to the Hanford Federal Facility Agreement and Consent Order executed by the signatories on July 28, 1995.

DOE J. D. Wagoner	Date	___ Approved	___ Disapproved
EPA C. Clarke	Date	___ Approved	___ Disapproved
Ecology M. Riveland	Date	___ Approved	___ Disapproved

Description/Justification of Change (Continued)

The REC complex of the 324 Building is designed to handle high activity radioactive wastes and materials in a research setting, with remote handling capabilities, and with appropriate shielding and unique space considerations.

A 324 hot cell restoration project (the B-Cell Cleanout Project (BCCP)) has been initiated in an effort to clean out and stabilize high activity, dispersible MW that have accumulated in the REC B-cell. Work under The BCCP will also result in the removal of MW, inactive research equipment, and other materials housed in the B-cell. Containerized MW are currently being stored in the REC (primarily in B-cell). One container of oil and absorbent from a 1994 B-cell shielded viewing window leak is stored in the D-cell. Containerized storage of high activity MW in the B-cell will continue until a technically sound pathway for storage elsewhere, and/or treatment and disposal is developed. Containerized MW storage in the REC may include waste transferred from the HLV tanks as a result of implementation of the preferred option identified via milestone M-89-01A. The (M-89-01A) report will identify the preferred option, provide planning/execution details and allow implementation of actions necessary to ensure safe handling and removal of liquid MW in the HLV tanks. Treatment and storage of HLV tank wastes in the REC will require development of an acceptable technical process and compliance with regulatory requirements.

High activity liquid MW is being stored in the 324 Building HLV tanks (e.g., TK-104, -105, -107). These wastes were originally utilized as radioactive feed materials for research and development projects conducted in the REC.

Initial assessment by USDOE of the waste management options for these materials has determined that they present difficult management challenges in that (at present) no definitive workplan for transportation, treatment and disposal, and/or long term permitted storage exists. Because of the location of the 324 building with respect to the Columbia River and the Tri-cities, the high activity of the wastes, and the dispersibility of the waste in the B-cell, these wastes pose a significant environmental, worker safety, and public health risk. These milestones have been proposed to minimize these risks in the near term, to achieve compliant management of the wastes, and to ensure long term protection of human health and the environment.

The following Milestones set the Schedule for key actions necessary to achieve compliance and complete closure of non-permitted mixed waste units in the 324 Building Radiochemical Engineering Cell (B-cell and D-cell), and High Level Vault:

M-89-00	Complete Closure of Non-Permitted Mixed Waste Units in the 324 Building REC B-cell, REC D-cell, and High Level Vault. *A date will be established for this Major Milestone immediately following Ecology approval of the REC/HLV closure plan (see M-20-55).	TBE*
M-89-01	Complete removal of 324 Building HLV tank MW (e.g., TK-104, TK-105, TK-107) with the exception of residues which may remain following flushing and draining to the extent possible.	10/31/96
M-89-01A	USDOE will submit to Ecology a report identifying the preferred option for management of liquid MW in the HLV tanks.	3/31/95

Description/Justification of Change (Continued)

M-89-02	Complete removal of 324 Building REC B-cell MW and equipment. Actions under this milestone include containment and removal of all B cell dispersible materials, excess equipment and debris. Containerized MW will be managed in compliance with chapter 173.303 WAC, thereby reducing risks to human health and the environment. Any remaining residues following removal actions will be managed through the final closure process. USDOEs' 324 building REC B cell clean-out project (BCCP) will be used as a guide for containerizing dispersible MW and removing unnecessary equipment and materials from B-cell.	5/31/99
M-89-03	Achieve compliance with interim status facility standards at non-permitted 324 building MW units. Because of high radiation fields associated with MW stored in the REC and HLV tanks, alternative compliance measures for some interim status requirements are expected. In these instances USDOE will propose alternative measures for Ecology approval no later than March 31, 1995.	3/31/95
M-89-04	Submit to Ecology a report identifying MW management alternatives and USDOE's proposal for achieving clean closure of the 324 Building REC B-cell, D-cell and HLV. This report will aid development of the 324 Closure Plan required by milestone M-20-55. The proposal will outline a feasible and cost effective program to achieve clean closure of the non-permitted storage units and compliant management of the MW currently stored in them.	6/30/95
M-20-55	Submit closure plan for Non-Permitted Mixed Waste Units located in the 324 Building REC B-cell, REC D-cell and HLV.	12/31/95

DOE/RL-96-73, Rev. 3
08/2005

Hanford Federal Facility Agreement and Consent Order

Fifth Amendment

July 1995

by

Washington State
Department of Ecology

United States
Environmental Protection Agency

United States
Department of Energy

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
AND THE
STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

IN THE MATTER OF:	)
	) FIFTH AMENDMENT OF
The U.S. Department of Energy,	) HANFORD FEDERAL FACILITY
Richland Operations Office,	) AGREEMENT AND CONSENT ORDER
Richland, Washington	)
	) EPA Docket Number: 1089-03-04-120
Respondent	) Ecology Docket Number: 89-54

In accordance with Article XXXIX of the Hanford Federal Facility Agreement and Consent Order ("Agreement") the Parties hereto agree to the attached amendments to the Agreement.

The approval of this Amendment further constitutes approval of the following Agreement change requests which are attached as part of this Amendment.

M-80-94-01 Establish milestones and target dates for PUREX and UO3 Facility Transition, Milestone Series M-80.

M-81-94-01 Establish milestones and target dates for the Fast Flux Test Facility (FFTF) transition, Milestone Series M-81.

M-83-94-01 Establish milestones for the Stabilization of Process Areas in PFP, Milestone Series M-83.

M-89-94-01 Complete closure of non-permitted Mixed Waste (MW) units in the 324 Building Radiochemical Engineering Cell (REC) and High Level Vault (HLV).

M-20-94-01 Milestone M-20-00 Modifications (1994 Facility Transition Negotiations).

A-94-01 Modify Appendix A To Include Facility Transition Decommissioning Process Terms, Update Environmental Restoration Terms, and Make Other Updates.

Modifications to the Agreement are indicated in the following manner:

~~Language removed from the text of the Agreement is displayed in strikeout mode.~~

Language added to the text of the Agreement is displayed in shaded mode.

IT IS SO AGREED:

Each undersigned representative of a Party certifies that he or she is fully authorized to enter into this Agreement and Action Plan and to legally bind such Party to this Agreement and Action Plan. These change requests and amendments shall be effective upon the date on which this fifth amendment agreement is signed by the Parties. Except as amended herein, the existing provisions of the Agreement shall remain in full force and effect.

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

for
Chuck Clarke
Regional Administrator
Region 10
U.S. Environmental Protection Agency

7/26/95
Date

FOR THE UNITED STATES DEPARTMENT OF ENERGY:

for
John Wagoner
Manager
U.S. Department of Energy
Richland Operations Office

7/25/95
Date

FOR THE WASHINGTON STATE DEPARTMENT OF ECOLOGY:

for
Mary Riveland
Director
State of Washington
Department of Ecology

7/28/95
Date

APPENDIX 1B

TRI-PARTY AGREEMENT CHANGE NUMBER M-89-98-03

This page intentionally left blank.

Change Number	Federal Facility Agreement and Consent Order Change Control Form	Date
M-89-98-03	Do not use blue ink. Type or print using black ink.	October 14, 1998

Originator: P. M. Knollmeyer **Phone**: 376-7435

Class of Change

[ ] I – Signatories [X] II – Executive Manager [ ] III - Project Manager

Change Title

Change due date for Hanford Federal Facility Agreement and Consent Order (Agreement) Milestone M-89-02 from 5/31/99 to 11/30/2000.

Description/Justification of Change

The due date for Agreement Milestone M-89-02 is changed to from May 31, 1999 to November 30, 2000. Additional project technical baseline information was developed as part of the 324 REC/HLV Closure Plan (DOE/RL-96-73, Rev.1) after Agreement Milestone M-89-02 was originally established. Based on this new information, November 30, 2000 is the date upon which the U.S. Department of Energy believes this activity can be completed. The project technical baseline indicates that the technical work is scheduled for completion November 17, 2000, consistent with the schedule contained in the "324 Building REC/HLV Closure Plan" (DOE/RL 96-73, Rev. 1). The additional time is for completion of the administrative process required to close the milestone.

M-89-02 COMPLETE REMOVAL OF 324 BUILDING REC B-CELL MW AND EQUIPMENT. 11/30/2000

ACTIONS UNDER THIS MILESTONE INCLUDE CONTAINMENT AND REMOVAL OF ALL B CELL DISPERSIBLE MATERIALS, EXCESS EQUIPMENT AND DEBRIS. CONTAINERIZED MW WILL BE MANAGED IN COMPLIANCE WITH CHAPTER 173-303 WAC, THEREBY REDUCING RISKS TO HUMAN HEALTH AND THE ENVIRONMENT. ANY REMAINING RESIDUES FOLLOWING REMOVAL ACTIONS WILL BE MANAGED THROUGH THE FINAL CLOSURE PROCESS. USDOE's 324 BUILDING REC B CELL CLEAN-OUT PROJECT (BCCP) WILL BE USED AS A GUIDE FOR CONTAINERIZING DISPERSIBLE MW AND REMOVING UNNECESSARY EQUIPMENT AND MATERIALS FROM B-CELL.

Impact of Change

No adverse impacts are foreseen from the change.

Affected Documents

Hanford Federal Facility Agreement and Consent Order, as amended.

Approvals

DOE	Date 10/20/98	✓ Approved	Disapproved
EPA	Date	Approved	Disapproved
Ecology	Date 11/7/98	✓ Approved	Disapproved

This page intentionally left blank.

APPENDIX 1C

TRI-PARTY AGREEMENT CHANGE NUMBER M-89-99-01

This page intentionally left blank.

Change Number M-89-99-01	Hanford Federal Facility Agreement and Consent Order Change Control Form Do not use blue ink. Type or print using black ink.	Date August 6, 1999

Originator
Keith A. Klein

Phone
(509) 376-7395

Class of Change

[X] I — Signatories [ ] II - Executive Manager [ ] III - Project Manager

Change Title

Complete closure of non-permitted mixed waste units in the 324 Building as described in the 324 Building REC/HLV Closure Plan, (DOE/RL-96-73). Due date for completion of closure activities may now be established as October 31, 2005, replacing the current "TBD" due date status of the major milestone M-89-00.

Description/Justification of Change

The Parties are required to agree on a date for this milestone following Ecology's approval of the "324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan" (per Tri-Party Agreement Milestone 20-55). Ecology issued its approval of the closure plan in a letter dated September 1, 1998. (The approved project technical baseline currently indicates these activities will be completed October 2005.)

Impact of Change

No additional impacts are foreseen. This change merely fulfills the requirement of the existing milestone to establish a due date for completion of all closure activities noted above following approval of the closure plan referred to above.

Affected Documents

Hanford Federal Facility Agreement and Consent Order Amendment Seven.

Approvals

	Date		
DOE	8/6/99	✓ Approved	___ Disapproved
EPA	8-18-99	✓ Approved	___ Disapproved
Ecology	8/9/99	✓ Approved	___ Disapproved

This page intentionally left blank.

APPENDIX 1D

TRI-PARTY AGREEMENT CHANGE NUMBER M-094-01-01

This page intentionally left blank.

Change Number	Federal Facility Agreement and Consent Order Change Control Form	Date
M-094-01-01	Do not use blue ink. Type or print using black ink.	4/24/2002

Originator — H. E. Bilson, RL, Assistant Manager River Corridor — **Phone** 376-6628

Class of Change

[X] I - Signatories   [ ] II - Executive Manager   [ ] III - Project Manager

Change Title
Milestone M-094-00
Establish date for Final Disposition of all 300 Area Surplus Facilities under the M-094 Series Milestones.

Description/Justification of Change

This change establishes a date for the disposition of all 300 Area surplus facilities. M-094-00 provides the overall framework for disposition of the 300 Area surplus facilities. This change aligns the M-094-00 milestones for 300 Area surplus facility dispositions with the objective of completion by 2018.

The use of strikeout and shading is not required since approval of this change request establishes a new series for the Tri-Party Agreement.

Continued on page 2

Impact of Change
Modifies regulatory requirements governing Hanford remediation activities. Administrative action required to incorporate this change into Appendix D.

Note that there are facilities that support the Hanford Site infrastructure that will remain in the 300 Area. Additionally, there may be waste sites that will not be remediated until the remaining facilities are removed due to their proximity to the facilities. The facilities and waste sites that remain will be documented and the path forward identified in Tri-Party Agreement Milestone M-094-04.

Affected Documents
The Tri-Party Agreement Action Plan – Appendix D, as amended and Hanford site internal planning, management, and budget documents (e.g., USDOE and USDOE contractor Baseline Change Control documents; Multi-Year Work Plans; Sitewide Systems Engineering Control documents; Project Management Plans; and, if appropriate, Site-wide LDR Report requirements).

Approvals

K. A. Klein, RL Manager — Date 4/26/02 — ✓ Approved ___ Disapproved

L. J. Iani, EPA Region 10 Administrator — Date 4/23/02 — ✓ Approved ___ Disapproved

Linda Hoffman for T. C. Fitzsimmons, Ecology Director — Date 4/30/02 — ✓ Approved ___ Disapproved

Tri-Party Agreement Change Request M-094-01-01
Page 2 of 3

Impact of Change (Continued)

M-094-00 provides the overall framework for disposition of the 300 Area surplus facilities. The following are the surplus facility changes associated with the River Corridor negotiations and specifically milestone M-094-00:

Milestone Additions	Description	Date
M-094-00	Complete disposition of 300 Area surplus facilities. Completion of facility disposition is defined as the completion of deactivation, decontamination, and decommissioning, and obtain EPA and/or Ecology approval of the appropriate project closeout documents. Surplus facilities are defined as any facility or site (including equipment) that has no identified programmatic use by the operating phase Program Secretarial Officer. The cleanup of 300-FF-2 waste sites associated with 300 Area surplus facilities will be performed in accordance with Tri-Party Agreement Major Milestone M-016-00B.	9/30/2018
M-094-01	Submit a schedule and TPA milestones to complete disposition of the following surplus facilities: 303M, 332, 333, 334, 334A, 3221, 3222, 3223, 3224, 3225, 324, 324B, 327(see TPA Change Request M-94-01-01, Table 1) The milestone deliverable shall include at least: 1) A schedule for submittals of Engineering Evaluation/Cost Analyses (EE/CA), removal action memoranda, removal action work plans, and other required documents for EPA and/or Ecology approval; 2) a schedule that defines initiation and completion dates for the disposition of the following surplus facilities: 303M, 332, 333, 334, 334A, 3221,3222, 3223, 3224, 3225, 324, 324B, 327; 3) a Tri-Party Agreement change package that includes milestones for groups of surplus facilities and associated waste sites that will ensure completion of M-094-00; and, 4) an evaluation of outyear Tri-Party Agreement milestones for the 300 Area to see if they can be accelerated. It is expected that schedules will be aligned with the associated schedules required by M-016-63. EE/CA's and action memoranda for the following facilities: 303M, 332, 333, 334, 334A, 3221, 3222, 3223, 3224 and 3225, must be completed and associated cleanup commenced prior to submitting any documents requiring EPA and/or Ecology approval for other 300 Area facility disposition work. This will allow the opportunity to factor "lessons learned from remedy implementation" into the remaining documents.	11/30/2003
M-094-02	Submit an amendment to the existing 324 Building REC/HLV closure plan, DOE/RL-96-73, Rev 1, for Ecology review and approval. The amendment shall change the existing closure plan path from clean closure to a path where the high-risk materials and wastes are removed from the facility followed by complete disposition.	7/30/2002
M-094-03	Complete disposition of the following surplus facilities: 303M, 332, 333, 334, 334A, 3221, 3222, 3223, 3224, 3225, 324, 324B, 327 (see TPA Change Request M-94-01-01, Table 1)	9/30/2010
M-094-04	Submit a schedule and Tri-Party Agreement milestones to complete disposition of the surplus facilities in the 300 Area and identify the 300 Area facilities and associated waste sites that will remain past the M-094-00 completion date (9/30/2018). The milestone deliverable shall include at least: 1) A schedule for submittals of Engineering Evaluation/Cost Analyses (EE/CA), removal action memoranda, removal action work plans, closure/post closure plans (in coordination with the 300 Area WATS and 340 Building associated work plans submittals as appropriate), and other documents that require EPA and/or Ecology approval; 2) a schedule that defines initiation and completion dates for the disposition of the surplus facilities; 3) a Tri-Party Agreement change package that includes milestones for groups of surplus facilities and associated waste sites that will ensure completion of M-094-00; and, 4) a clearly defined mission and Tri-Party Agreement disposition path for any remaining facilities in the 300 Area. It is expected that schedules will be aligned with the associated schedules required by M-016-65.	8/30/2005

Tri-Party Agreement Change Request M-094-01-01
Page 3 of 3

Table 1: 300 Area Surplus Facilities to be Dispositioned by 9/30/2010

Surplus Facilities	Facility Description
Building 303M	Uranium Oxide Building
Building 332	Packaging Test Facility
Building 333	N Fuels Building
Building 334	Process Sewer Monitor Facility
Building 334A	Waste Acid Storage Building
Building 3221	Sandblasting Support Building
Building 3222	Storage Building
Building 3223	Storage Building
Building 3224	Storage Building
Building 3225	Bottle Dock
Building 324	Chemical Engineering Laboratory
Building 324B	Chemical Engineering Laboratory Exhaust Stack
Building 327	Post-Irradiation Test Laboratory

age 238 of 299 of DA862460

This page intentionally left blank.

APPENDIX 1E

TRI-PARTY AGREEMENT CHANGE NUMBER M-94-03-01

This page intentionally left blank.

Change Number	Federal Facility Agreement and Consent Order Change Control Form Do not use blue ink. Type or print using black ink.	Date:
M-94-03-01		August 27, 2003

Originator:	Phone:
K. D. Bazzell, RL Facility Transition Division E. B. Dagan, RL Regulatory Compliance and Assurance Division	509-376-0563 509-376-3811

Class of Change:

[ ] I - Signatories   [X] II - Executive Manager   [ ] III - Project Manager

Change Title:

Modification of Tri-Party Agreement Interim Milestone M-094-01

Description/Justification of Change:

In October 2001, the U.S. Department of Energy, Richland Operations Office, (RL), the State of Washington, Department of Ecology (Ecology), and the U.S. Environmental Protection Agency (EPA), hereinafter referred to as the parties, entered into negotiations for cleanup schedules consistent with the common objective of remediating waste sites and facilities located along the Columbia River by September 30, 2018. The negotiations were formalized with the approval of Tri-Party Agreement change packages. As a result, a new milestone series was created to follow the disposition of all 300 Area surplus facilities. During the negotiations, a November 30, 2003, date was established for Tri-Party Agreement Interim Milestone M-094-01

To accelerate cleanup work along the Columbia River, the U.S. Department of Energy (DOE) issued a Request for Proposal in March 2002 to pursue procurement of a new, first-of-a-kind closure contract. The contracting approach was designed to accelerate risk reduction and closure of 210-square-miles beginning at the shores of the Columbia River and extending inland to the middle of the Hanford Site. The completion date of November 30, 2003 for M-094-01 was established based on an August 2002 contract award. Because of various procurement delays, RL is proposing that the M-094-01 completion date be modified to September 30, 2004. RL will then incorporate the M-094-04 workscope into the M-094-01 milestone by combining the two milestones. M-094-04, which had an original completion date of 08/30/2005, will be accelerated 11 months to a September 30, 2004 completion date.

Description/Justification of Change continues on page 2.

Impact of Change:

Tri-Party Agreement Interim Milestone M-094-01 is extended 10 months and Tri-Party Agreement Interim Milestone M-094-04 is combined with M-094-01 and accelerated 11 months to September 30, 2004 as compared to the original completion date of 08/30/2005. Tri-Party Agreement Interim Milestones M-016-63 and M-016-65 are companion milestones to M-094-01 and M-094-04 respectively and are proposed for modification under Tri-Party Agreement Change Request M-016-03-01.

Modifies regulatory requirements governing Hanford remediation activities. Administrative action required to incorporate this change into Appendix D.

Affected Documents:

The Hanford Federal Facility Agreement and Consent Order, as amended, and Hanford Site internal planning management, and budget documents (e.g., USDOE and USDOE contractor Baseline Change Control documents; Multi-Year Work Plan; Sitewide Systems Engineering Control Documents; Project Management Plans, and, if appropriate, LDR Report requirements).

Approvals:

Willard Ballard W. W. Ballard, RL IAMIT Representative	9/2/03 Date	✓ Approved	___ Disapproved
Nick Ceto N. Ceto, EPA IAMIT Representative	9/5/03 Date	✓ Approved	___ Disapproved
[signature] M. A. Wilson, Ecology IAMIT Representative	9/3/03 Date	✓ Approved	___ Disapproved

Tri-Party Agreement Change Request
M-94-03-01
Page 2 of 2

Modifications/deletions of existing milestones are denoted using ~~redline/strikeout~~; additions are denoted with [illegible])

Milestone Number	Milestone Description	Completion Date
M-094-01	Submit a schedule and [illegible] Tri-Party Agreement milestones to complete disposition of the following surplus facilities: 303M, [illegible] (See TPA Change Request M-94-01-01 [illegible]) [illegible] the M-094-00 completion [illegible] The milestone deliverable shall include at least: 1) A schedule for submittals of Engineering Evaluation/Cost Analyses (EE/CA), removal action memoranda, removal action work plans, closure/[illegible] and other required documents for [illegible] EPA and/or Ecology approval; 2) a schedule that defines initiation and completion dates for the disposition of the following [illegible] surplus facilities [illegible] [illegible] 3) a Tri-Party Agreement change package that includes milestones for groups of surplus facilities and associated waste sites that will ensure completion of M-094-00; and, 4) [illegible] It is expected that schedules will be aligned with the associated schedules required by M-016-61. EE/CA's and action memorandum for the following facilities, 303M, 332, 333, 334, 334A, ~~3221, 3222, 3223, 3224~~, and 3225, must be completed and associated cleanup commenced prior to submitting any documents requiring EPA and/or Ecology approval for other 300 area facility disposition work. This will allow the opportunity to factor "lessons learned from remedy implementation" into the remaining documents.	~~[illegible]~~ 09/30/2004
~~M-094-01~~	~~Submit A Schedule and Tri-Party Agreement Milestones To Complete Disposition of the Surplus Facilities in the 300 Area and Identify [illegible] 300 Area Facilities and Associated Waste Sites That Will Remain Past the M-094-00 Completion Date (09/30/2018).~~ ~~The Milestone Deliverable Shall Include At Least: 1) A Schedule For Submittals of Engineering Evaluation/Cost Analyses (EE/CA), Removal Action Memoranda, Removal Action Work Plans, Closure/Post Closure Plans (In Coordination With The 300 Area [illegible] Work Plans [illegible]) As Appropriate, and Other Documents That Require EPA and/or Ecology Approval; 2) A Completion Schedule That Defines Initiation and Completion Dates for the Disposition of the Surplus Facilities; 3) A Tri-Party Agreement Change Package That Includes Milestones for Groups of Surplus Facilities and Associated Waste Sites That Will Ensure Completion of M-094-00; and, 4) A Clearly Defined [illegible] and Tri-Party Agreement Disposition Path for Any Remaining Facilities in the 300 Area. It Is Expected That Schedules Will Be Aligned With the Associated Schedules Required by M-016-55.~~	~~[illegible]~~

APPENDIX 1F

TRI-PARTY AGREEMENT CHANGE NUMBER M-94-04-01

age 244 of 299 of DA852460

This page intentionally left blank.

Change Number	Federal Facility Agreement and Consent Order Change Control Form Do not use blue ink. Type or print using black ink.	Date:
M-94-04-01		September 22, 2004

Originator:	Phone:
K. D. Bazzell, RL Facility Transition Division D. E. Jackson, RL Office of Environmental Services	509-376-0463 509-376-8066

Class of Change:

[X] I – Signatories [ ] II – Executive Manager [ ] III – Project Manager

Change Title:

Modify the Deliverables and Completion date for the 300 Area Surplus Facilities Under Tri-Party Agreement Milestone Series M-094

Description/Justification of Change:

In October 2001, the U.S. Department of Energy, Richland Operations Office, (RL), the State of Washington, Department of Ecology (Ecology), and the U.S. Environmental Protection Agency (EPA), hereinafter referred to as the Parties, entered into negotiations for cleanup schedules consistent with the common objective of remediating waste sites and facilities located along the Columbia River by September 30, 2018. The negotiations were formalized with the approval of Tri-Party Agreement change packages.

To accelerate cleanup work along the Columbia River, the U.S. Department of Energy (DOE) issued a Request for Proposal in March 2002 to pursue procurement of a new, first-of-a-kind closure contract. The contracting approach was designed to accelerate risk reduction and closure of 210-square-miles beginning at the shores of the Columbia River and extending inland to the middle of the Hanford Site. In the December 2003/January 2004 timeframe, DOE solicited input from prospective Offerors, other interested parties and industry to ensure that this contracting approach was an effective way to close the Hanford Site River Corridor. As a result, major changes were made to the RFP and RL reissued it in July 2004. Proposals are due back by September 23, 2004, and contract award is scheduled for January 31, 2005. The selected contractor will then have 180 days (6 months) to submit a baseline and schedule for the River Corridor workscope.

The existing September 30, 2004, completion date for Tri-Party Agreement Milestone M-094-01, *Submit a Schedule and Tri-Party Agreement Milestones to Complete Disposition of the Surplus Facilities in the 300 Area*, was predicated on the selection of the River Corridor Contractor by December 2003, which did not occur. Despite the fact that the contract has not been awarded, the Parties have agreed to changes to the M-094 milestone series. The existing Tri-Party Agreement Major Milestone, M-094-00, completion date was accelerated 3 years to correspond with the expected new contract strategy end date; the existing Tri-Party Agreement Interim Milestone M-094-01 was delayed 15 months to accommodate the new contract baseline development schedule; and a new Tri-Party Agreement Interim Milestone, M-094-05, was added to show progress towards *deactivation, decontamination*.

Description/Justification of Change continues on page 2.

Impact of Change:

Modify Tri-Party Agreement Major Milestone M-094-00, Tri-Party Agreement Interim Milestone M-094-01, and establishes a new Tri-Party Agreement Interim Milestone M-094-05. Modifies regulatory requirements governing Hanford remediation activities. Administrative action required to incorporate this change into Appendix D.

Affected Documents:

The Hanford Federal Facility Agreement and Consent Order, as amended, and Hanford Site internal planning management, and budget documents (e.g., USDOE and USDOE contractor Baseline Change Control documents; Multi-Year Work Plan; Sitewide Systems Engineering Control Documents; Project Management Plans, and, if appropriate, LDR Report requirements).

Approvals:

K. Klein, RL Manager	Date	____ Approved	____ Disapproved
R. Kreizenbeck, Acting Administrator, EPA Region 10	Date	____ Approved	____ Disapproved
L. Hoffman, Ecology Interim Director	Date	____ Approved	____ Disapproved

Tri-Party Agreement Change Request
M-94-04-01
Page 2 of 2

decommissioning and demolition of 300 Area high priority facilities. Changes to existing milestones and proposed milestones are identified on page 2 of this Tri-Party Agreement Change Request. It should be noted that the companion milestone M-094-03, *Complete Disposition of the Following Surplus Facilities: 303M, 333, 313, 334, 334A, 3221, 3222, 3223, 3224, 3225, 324, 324B, 327 (See Tri-Party Agreement Change Request M-94-01-01, Table 1)*, remains unchanged by these negotiations.

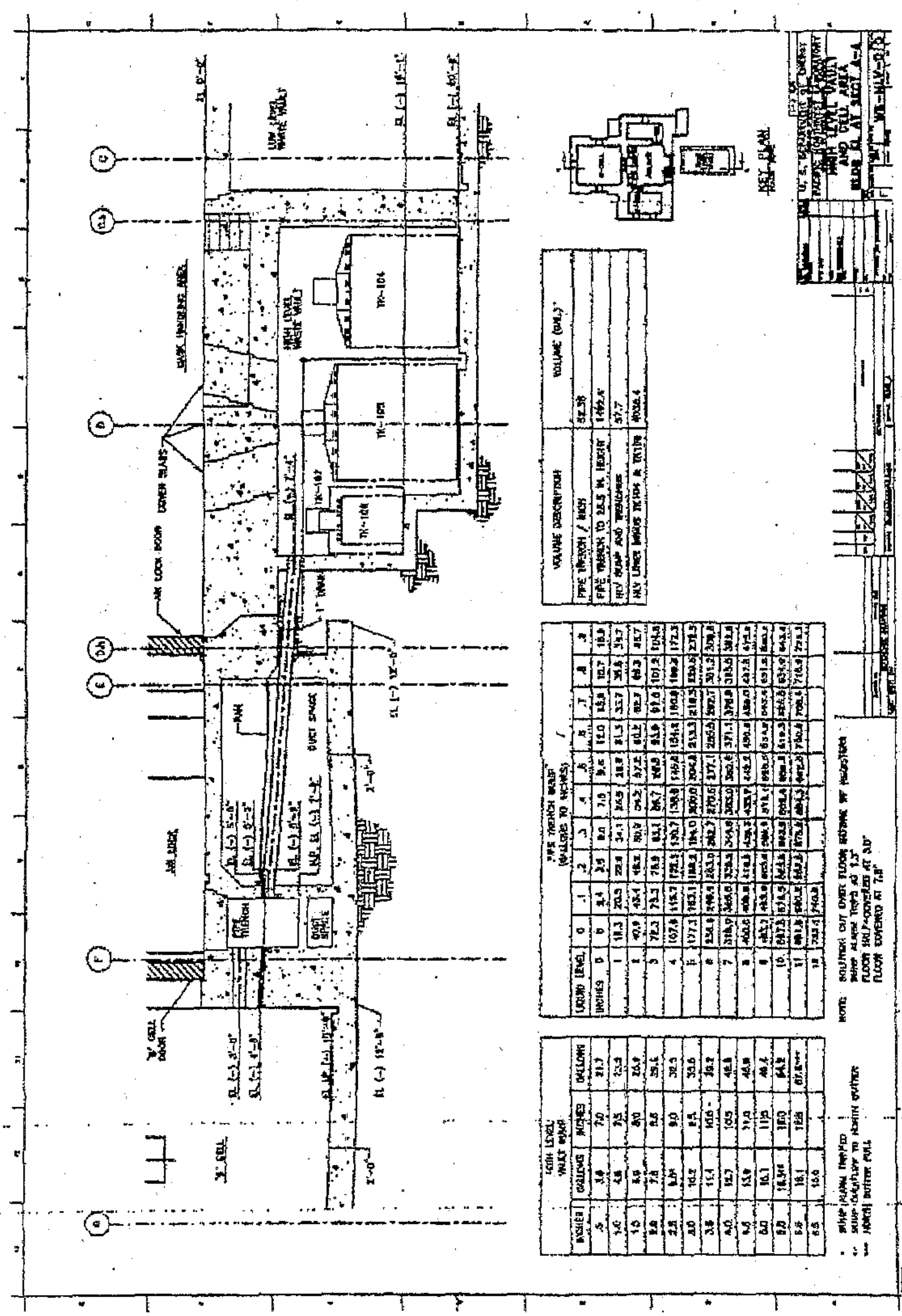
Modifications/deletions of existing milestones are denoted using ~~strikeout~~; additions are denoted with [illegible].

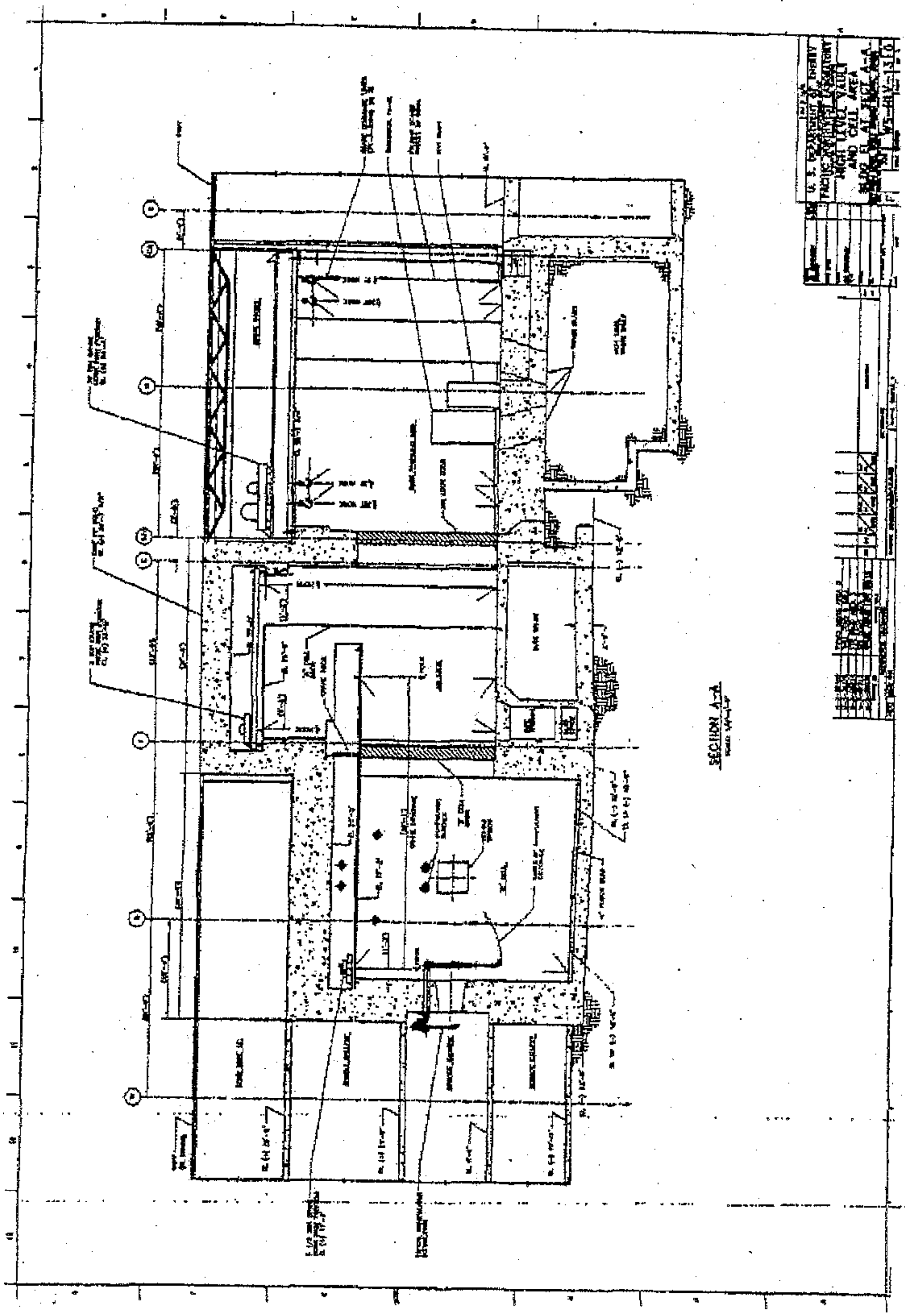
Milestone Number	Milestone Description	Completion Date
M-094-00	Complete disposition of 300 Area Surplus Facilities [illegible] Completion of facility disposition is defined as the completion of deactivation, decontamination, and decommissioning, and [illegible] in EPA and/or Ecology approval of the appropriate project closeout documents. ~~Surplus facilities are defined as any facility or site (including equipment) that has no identified programmatic use by the Operating Phase Program Functional Officer.~~ The cleanup of 300-FF-2 Waste Sites associated with 300 Area surplus facilities will be performed in accordance with Tri-Party Agreement Major Milestone M-016-00B.	~~[illegible]~~ [illegible]
M-094-01	Submit a Schedule and Tri-Party Agreement Milestones to Complete Disposition of the Surplus Facilities in the 300 Area. ~~And Identify The 300 Area Facilities And Associated Waste Sites That Will Remain Past M-094-00 (September 30, 2018)~~ The milestone deliverable shall include at least: 1) A schedule for submittals of engineering evaluation/cost analyses (EE/CA), removal action memoranda, removal action work plans, closure/post closure plans and other documents that require EPA and/or Ecology approval; 2) A schedule that defines initiation and completion dates for the disposition of groups of surplus facilities and associated waste sites; [illegible] 3) A Tri-Party Agreement Change Package that includes milestones for groups of surplus facilities and associated waste sites that will assure completion of M-094-00; ~~4) A Clearly Defined Mission and Tri-Party Agreement Disposition Path For Any Remaining Facilities In The 300 Area. It is expected that~~ [illegible] schedules will [illegible] be [illegible] aligned with the associated schedules required by M-016-53. ~~EE/CA's and action memoranda for the following facilities: 303M, 333, 3221, 334, 334A, and 3225, must be completed and associated cleanup commenced prior to submitting any document requiring EPA and/or Ecology approval for other 300 Area facility disposition work. This will allow the opportunity to factor "lessons learned from remedy implementation" into future similar documents.~~	~~09/30/2004~~ [illegible]
[illegible]	[illegible]	[illegible]

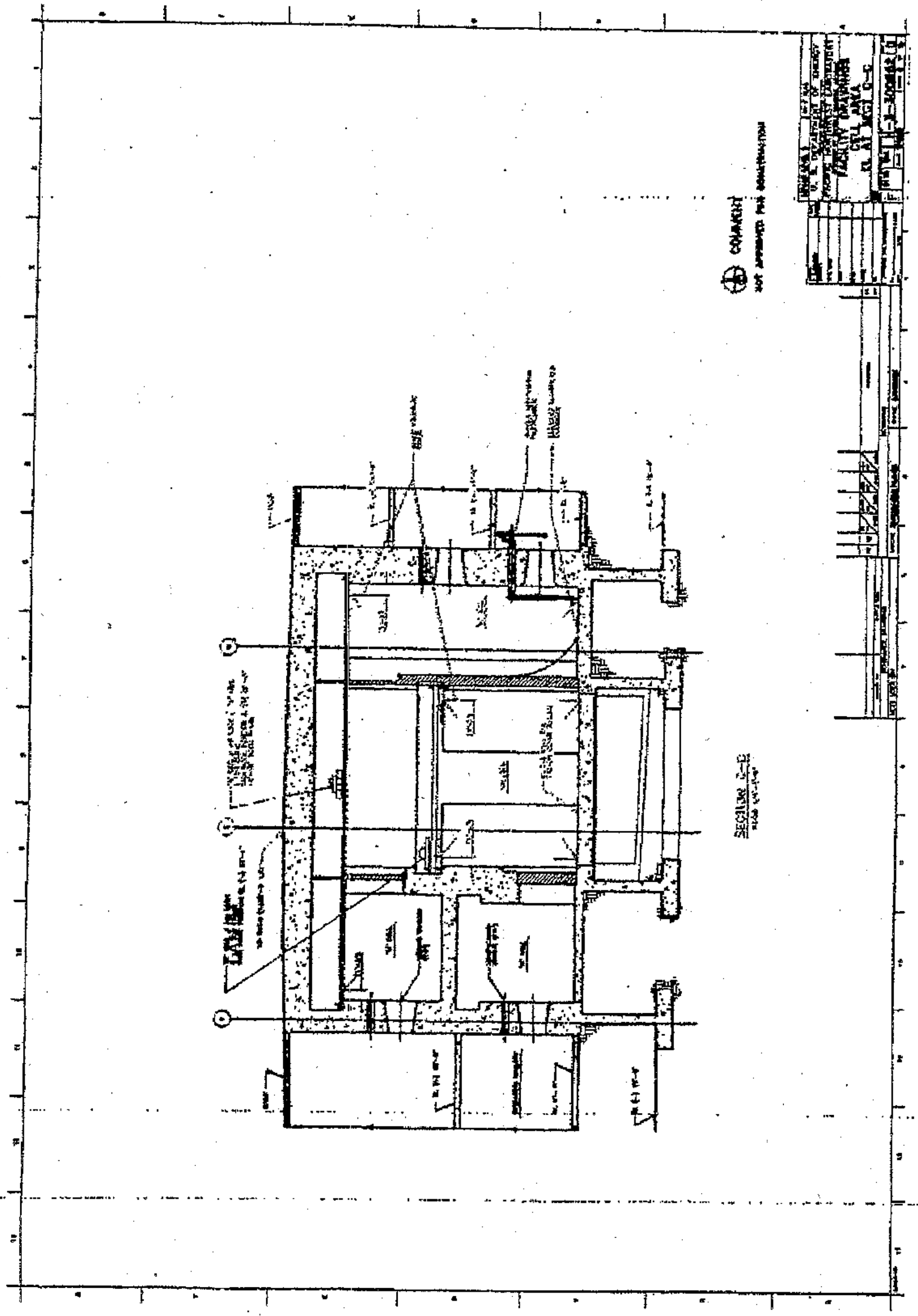
BEST AVAILABLE COPY

APPENDIX 2A

324 BUILDING ENGINEERING DRAWINGS


KEY PLAN
TK-104
TK-103
TK-102
TK-101
AIR LOCK
PIPE TRENCH
DUCT SPACE
VOLUME DESCRIPTION
VOLUME (GAL)


SECTION A-A

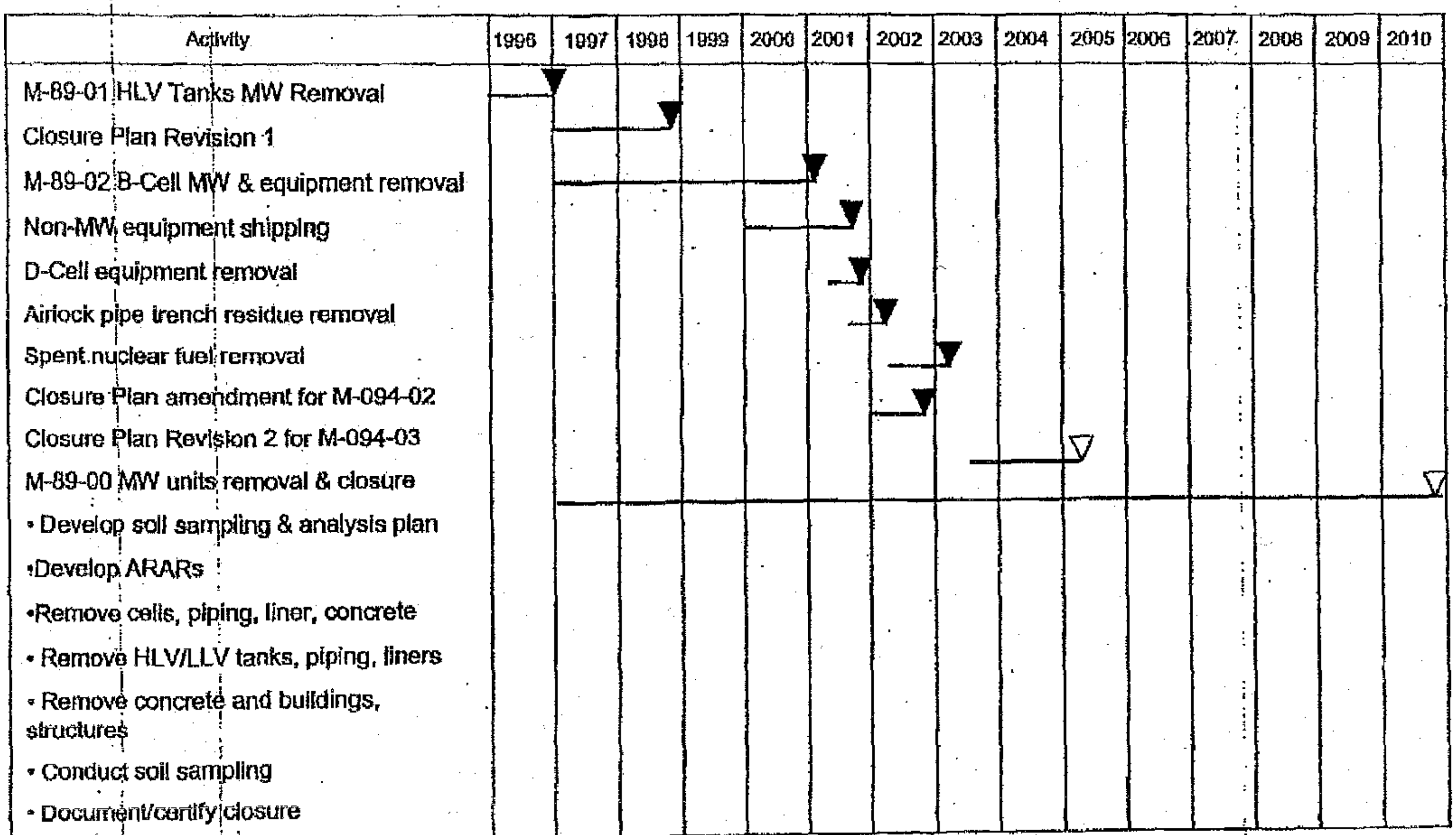


This page intentionally left blank.

APPENDIX 7A

SCHEDULE FOR CLOSURE ACTIVITIES

This page intentionally left blank.


Activity
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
M-89-01 HLV Tanks MW Removal
Closure Plan Revision 1
M-89-02 B-Cell MW & equipment removal
Non-MW equipment shipping
D-Cell equipment removal
Airlock pipe trench residue removal
Spent nuclear fuel removal
Closure Plan amendment for M-094-02
Closure Plan Revision 2 for M-094-03
M-89-00 MW units removal & closure
• Develop soil sampling & analysis plan
•Develop ARARs
•Remove cells, piping, liner, concrete
• Remove HLV/LLV tanks, piping, liners
• Remove concrete and buildings, structures
• Conduct soil sampling
• Document/certify closure

This page intentionally left blank.

DOE/RL-96-73, Rev. 3
08/2005

DISTRIBUTION

Washington State Department of Ecology	
F. W. Bond	H0-57
J. J. Wallace	H0-57

J. Van Pelt, Environmental Compliance
Confederated Tribes of the Umatilla Indian Reservation
Hanford Operations Office
750 Swift Boulevard, Suite 12
Richland, Washington 99352

G. Bohnee
Nez Perce Tribe
P. O. Box 365
Lapwai, Idaho 83540

R. Jim, Manager
Environmental Restoration/Waste Management Program Yakama Nation
P.O. Box 151
Toppenish, Washington 98948

Dirk A. Dunning
Oregon Office of Energy
625 Marion Street N.E., Suite 1
Salem, OR 97301-3742

U.S. Department of Energy. Richland Operations Office	
K. D. Bazzell	A3-04
B. L. Charboneau	A5-15
R. F. Guercia	A3-04
A. C. McKarns	A5-15
R. G. Hastings	A5-19
Public Reading Room	H2-53
Washington Closure Hanford	
G. G. Meyer	H0-21
B. A. Smith	L1-01
D. M. Yasek (2)	L1-07
Lockheed Martin Information Technology	
Environmental Portal	A3-95
DPC	H6-08
EDMC (2)	H6-08
Pacific Northwest National Laboratory	
Hanford Technical Library	P8-55

ENCLOSURE 2

State Environmental Policy Act Environmental Checklist
for the Hanford Facility

324 Building Radiochemical Engineering Cells,
High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan,
DOE/RL-96-73, Revision 3

age 260 of 295 of DA052460

STATE ENVIRONMENTAL POLICY ACT
ENVIRONMENTAL CHECKLIST

FOR THE

HANFORD FACILITY,
324 BUILDING RADIOCHEMICAL ENGINEERING CELLS, HIGH-LEVEL VAULT, LOW-LEVEL VAULT, AND ASSOCIATED AREAS CLOSURE PLAN

REVISION 2

SEPTEMBER 2005

WASHINGTON ADMINISTRATIVE CODE
ENVIRONMENTAL CHECKLIST
[WAC 197-11-960]

A. BACKGROUND

1. Name of proposed project, if applicable:

This *State Environmental Policy Act* (SEPA) *of 1971* Environmental Checklist is being submitted for closure of the Hanford Facility, 324 Building Radiochemical Engineering Cells (REC), High-Level Vault (HLV), Low-Level Vault (LLV), and Associated Areas. These aforementioned areas will be closed with respect to dangerous waste contamination that resulted from treatment operations as a *Resource Conservation and Recovery Act* (RCRA) *of 1976* treatment, storage, and/or disposal (TSD) unit.

2. Name of applicants:

U.S. Department of Energy, Richland Operations Office (DOE-RL).

3. Address and phone number of applicants and contact persons:

U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

Contact:

Keith A. Klein, Manager
Richland Operations Office
(509) 376-7395

4. Date checklist prepared:

September 2005.

5. Agency requesting the checklist:

Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

6. Proposed timing or schedule: (including phasing, if applicable):

This SEPA Environmental Checklist is being submitted concurrently with a closure plan prepared in accordance with Washington Administrative Code (WAC) 173-303 Dangerous Waste Regulations. The closure plan will be submitted to the Washington State Department of Ecology by September 2005.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

Yes. Closure of the 324 Building mixed waste units (Milestone M-89-00) will be performed in parallel with the complete disposition of the 324 Building (under Milestone M-094-03). The complete disposition of the 324 Building will be addressed as a separate project, as necessary, as part of the preparation for M-094-03 activities.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

This revised SEPA Environmental Checklist is being submitted to Ecology to address the 324 Building mixed waste unit closure activities. Previously, Revision 0 of this SEPA Environmental Checklist, submitted concurrently with the Notice of Intent for the Hanford Facility, was submitted in March 1998. Revision 1 of this SEPA Environmental Checklist was submitted with Revision 2 of the closure plan in May 2005.

Final disposition of the 300 Area, including the 324 Building, will be addressed in appropriate *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *of 1980* documentation as identified in the M-094 series milestones of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement).

General information concerning the Hanford Facility environment can be found in the *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Revision 16, September 2004. This document is updated annually by Pacific Northwest National Laboratory (PNNL), and provides current information concerning climate and meteorology, ecology, history and archeology, socioeconomic, land use and noise levels, and geology and hydrology. These baseline data for the Hanford Site and past activities are useful for evaluating proposed activities and their potential environmental impacts.

The "Radioactive Air Emissions Notice of Construction for Deactivation Activities at the 324 Building", DOE/RL-96-73, Revision 1, December 2001, is in place.

9. Do you know whether applications are pending for government approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other applications are pending. However, the 324 Building lies within CERCLA operable units (OU) 300-FF-2 and 300-FF-5 as designated by the Tri-Party Agreement. These OUs are scheduled to be remediated under CERCLA using the remedial investigation and feasibility study process.

10. List any government approvals or permits that will be needed for your proposal, if known.

DOE-RL and Ecology will approve the 324 REC/HLV closure plan. Closure of the 324 Building mixed waste units (Milestone M-89-00) will be performed in parallel with the complete disposition of the 324 Building (under Milestone M-094-03). The complete disposition/demolition of the 324 Building will be performed as a separate project as part of Tri-Party Agreement Milestone M-094-03 activities, which will be covered by CERCLA documentation.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.

The DOE-RL proposes closure of a non-permitted TSD unit housed within the 324 Building. The closure unit boundary was developed using the data quality objective process. The areas of the building requiring closure activities include B-Cell, D-Cell, the REC airlock, the REC airlock pipe trench, the

HLV, the LLV, the HLV sample room (Room 145), the Engineering Development Lab-146, the galleries, and Room 18.

After the waste inventory has been removed, clean closure of the REC, the HLV, and LLV, the piping, and associated areas will be accomplished by removing these components to meet the closure performance standard. Closure of the HLV and LLV will include removal of the tanks and all metal and concrete surfaces to meet the performance standard. Piping that has transported dangerous waste to or from an area within the closure boundary will be removed. For piping embedded in concrete, the piping and concrete will be removed. Closure activities also will include removal of the cell liners and piping, HLV and LLV tanks, liners and piping, pipe trench piping and concrete, HLV sample room piping, Engineering Development Lab-146 piping from HLV and LLV, galleries piping from HLV and LLV, and Room 18 piping from HLV and LLV and associated contaminated concrete.

Closure activities will include removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Soil and groundwater contamination existed prior to operations of the 324 Building TSD unit. The pre-existing soil and groundwater contamination will be addressed through 300 Area CERCLA soil remediation activities.

Closure of the 324 Building closure areas will be performed in accordance with the Ecology-approved closure plan.

12. **Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

The 324 Building is located near the corner of Locust Street and the George Washington Way Extension north of the city of Richland, in the 300 Area of the Hanford Site.

TO BE COMPLETED BY APPLICANT | EVALUATIONS FOR AGENCY USE ONLY

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other__________.

Flat.

b. What is the steepest slope on the site (approximate percent slope)?

The approximate slope of the land is less than 2 percent.

c. What general types of soils are found on the site? (for example, clay, sandy gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Soil types consist mainly of eolian and fluvial sands and gravel. More detailed information concerning specific soil classifications can be found in the *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Revision 16, September 2004. Farming is not permitted on the Hanford Facility.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

No filling or grading is required.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Not applicable. No construction is proposed as part of this project.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

None.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities, if known.

Routine closure activities would generate dust.

An airborne radiological release could occur as a result of upset conditions. Such a release would not exceed immediately dangerous to life and health concentrations outside the immediate area of the spill/release because of the small quantity of material that is available for release.

b. Are there any off-site sources of emissions or odors that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to the air, if any?

Good engineering practices [e.g., applying the principle of As Low As Reasonably Achievable (ALARA)] would be followed, and actions would comply with onsite procedures designed to protect the environment and personnel safety and health.

3. Water

a. Surface

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The Columbia River is in the vicinity of the 324 Building. However, the 324 Building is a nonland-based facility as defined in WAC 173-303-282(3)(i). The WAC 173-303-282(6)(c)(i)(B)(I) requires nonland-based

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

facilities be located at least 152 meters from any perennial water body. The WAC 173-303-282(6)(d)(i) requires nonland-based facilities be located at least 152 meters from any wetlands, designated critical habitats, habitats designated by the Washington Department of Wildlife as habitat essential to the maintenance or recovery of any state listed threatened or endangered wildlife species, natural areas that are acquired or voluntarily registered or dedicated by the owner, or state or federally designated wildlife refuges, preserves, or bald eagle protection areas. The 324 Building is over 152 meters from any of the aforementioned areas.

2) **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

The work would not require any activity in or near the described waters and drainage.

3) **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

There would be no dredging or filling from or to surface water or wetlands.

4) **Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.**

The water supply for the 300 Area is pumped from the Columbia River. The 324 Building closure activities would use relatively little of this overall withdrawal. The estimated amounts are insignificant compared to normal daily water use in the 300 Area.

5) **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

The 324 Building is not within the 100-year or 500-year floodplain [*Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Revision 16, September 2004].

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

6) **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

No.

b. Ground

1) **Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.**

If the 324 Building areas cannot be clean closed in accordance with the closure plan, postclosure groundwater monitoring might be required.

2) **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

None.

c. Water Run-off (including storm water)

1) **Describe the source of run-off (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

The Hanford Facility receives only 15.2 to 17.8 centimeters of annual precipitation. Precipitation runs off the existing buildings and seeps into the soil on and near the buildings. This precipitation does not reach the groundwater or surface waters.

2) **Could waste materials enter ground or surface waters? If so, generally describe.**

Engineering controls during closure activities, such as using dry decontamination methods, visually checking the liners for breaches before using decontamination solutions (and minimizing the use of liquid solutions), etc., will prevent dangerous waste materials from entering ground or surface waters. All waste materials would be contained.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

d. Proposed measures to reduce or control surface, ground, and run-off water impacts, if any:

Measures would include visually checking for breaches or cracks, and sealing any found (or containing solutions in a catch pan), before using decontamination solutions; and using dry decontamination methods and minimizing the use of liquids.

4. Plants

a. Check or circle the types of vegetation found on the site.

- ☒ deciduous tree: alder, maple, aspen, other
- ☐ evergreen tree: fir, cedar, pine, other
- ☒ shrubs
- ☒ grass
- ☐ pasture
- ☐ crop or grain
- ☐ wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
- ☐ water plants: water lily, eelgrass, milfoil, other
- ☐ other types of vegetation

The most common vegetation community in the 300 Area is sagebrush/cheatgrass or Sandberg's bluegrass. Native vegetation in the immediate vicinity of the 324 Building has been eradicated. Vegetation consists primarily of cultivated ornamentals.

b. What kind and amount of vegetation will be removed or altered?

No vegetation would be removed or altered during 324 Building TSD unit closure activities.

c. List threatened or endangered species known to be on or near the site.

The 300 Area, and the immediate vicinity of the 324 Building, is a previously disturbed, highly-industrialized area and is not conducive to habitat for any of the federal and state listed threatened and endangered plant and animal species found on the Hanford Facility. Additional information on species can be found in *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415 (Revision 16, September 2004).

TO BE COMPLETED BY APPLICANT | **EVALUATIONS FOR AGENCY USE ONLY**

d. **Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:**

None.

5. Animals

a. **Indicate (by underlining) any birds and animals which have been observed on or near the site or are known to be on or near the site:**

birds: Raptors (burrowing owls, ferruginous, redtail, and Swainson's hawks) eagles, songbirds,
animals: deer, elk, coyotes, rabbits, rodents.

Additional information on animals can be found in *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415 (Revision 16, September 2004).

b. **List any threatened or endangered species known to be on or near the site.**

One federal and state listed threatened or endangered species has been identified on the 1,517 square kilometer Hanford Site along the Columbia River (the bald eagle) and three in the Columbia River (steelhead, spring-run Chinook salmon, and bull trout). In addition, the state listed white pelican, sandhill crane, and ferruginous hawk also occur on or migrate through the Hanford Site.

c. **Is the site part of a migration route? If so, explain.**

The Hanford Site is a part of the broad Pacific Flyway. However, the 324 Building location is not known as a haven for migratory birds.

d. **Proposed measures to preserve or enhance wildlife, if any:**

This project contains no specific measures to preserve or enhance wildlife.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Existing 300 Area utility sources will include electricity used at the 324 Building for heating and lighting the support structures and for perimeter lighting.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

None. Energy consumption is not anticipated to be significant for 324 Building closure activities.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

Possible environmental health hazards to personnel could arise from activities at the 324 Building associated with exposure to radioactive, dangerous, and/or mixed waste. Environmental health hazards could arise from incidental activities within the 324 Building and/or the 300 Area. A chemical spill, release, fire, or explosion could occur only as a result of a simultaneous breakdown in multiple barriers or a catastrophic natural forces event.

1) Describe special emergency services that might be required.

Hanford Site security, fire response, and ambulance services are on call at all times in the event of an onsite emergency. Hanford Site emergency services personnel are trained specially to manage a variety of circumstances involving chemical and/or mixed waste constituents and situations.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

2) **Proposed measures to reduce or control environmental health hazards, if any:**

All personnel are trained to follow proper procedures during the closure operations to minimize potential exposure. The 324 Building has systems for ventilation, radiation monitoring, fire protection, and alarm capability. The heating, ventilation, and air conditioning system maintains a negative air pressure in the 324 Building.

Chemical and radiological safety hazards would be mitigated by preventing direct contact with the residual chemical constituents; high-efficiency particular air filtration of all offgas streams; and protective clothing, appropriate training, and respiratory protection used by onsite personnel as necessary. ALARA principles would be applied during closure activities.

b. Noise

1) **What type of noise exists in the area which may affect your project (for example: traffic, equipment, operation, other)?**

While there is a minor amount of traffic, operation, and equipment noise in the vicinity, there would be minimal affect to personnel at the 324 Building.

2) **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

Minor amounts of noise from traffic and equipment are expected during day shift hours for operations.

3) **Proposed measures to reduce or control noise impacts, if any:**

In the unlikely event that Occupational Safety and Health Administration noise standards would be exceeded, appropriate measures to protect personnel would be employed.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

Current use of the 324 Building site and adjacent properties is industrial/research.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

b. Has the site been used for agriculture? If so, describe.

No portion of the 300 Area has been used for agricultural purposes since 1943.

c. Describe any structures on the site.

The 324 Building, located in the 300 Area, is a steel and reinforced concrete structure. Numerous buildings surround the 324 Building as a result of the developed 300 Area.

d. Will any structures be demolished? If so, what?

No. The scope of the 324 REC closure plan is to remove the TSD unit components from the 324 Building (Tri-Party Agreement Milestone M-89-00), but does not include building demolition. The closure plan activities (M-89-00) will be performed in parallel with the complete disposition/demolition of the 324 Building, which will be performed under Tri-Party Agreement Milestone M-094-03. The complete disposition/demolition of the 324 Building required by M-094-03 will be performed as a parallel project, which will be covered by CERCLA documentation.

e. What is the current zoning classification of the site?

Does not apply. The site is located on Federal lands and as such is not subject to the Growth Management Act (State of Washington land use authority). However, for completeness, the Hanford Site is currently included in the Benton County Comprehensive Plan (June 22, 1998) as the undesignated "Hanford Sub-Area".

f. What is the current comprehensive plan designation of the site?

The Federal land management decision process has determined through NEPA [*Hanford Comprehensive Land-Use Plan Environmental Impact Statement Record of Decision* (64 FR 61615, November 12, 1999)] that the 300 Area geographic area, which includes the 324 Building, is designated Industrial.

g. If applicable, what is the current shoreline master program designation of the site?

Does not apply.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

Minimal staff would provide appropriate surveillance and maintenance of the 324 Building area after closure in conjunction with the overall 300 Area surveillance and maintenance activities.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Does not apply.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Does not apply (refer to Section B.8.f.).

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

Does not apply.

TO BE COMPLETED BY APPLICANT | **EVALUATIONS FOR AGENCY USE ONLY**

10. Aesthetics

a. **What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

No new structures are being proposed. The unit is located in an existing building, which is approximately is approximately 14 meters tall.

b. **What views in the immediate vicinity would be altered or obstructed?**

None.

c. **Proposed measures to reduce or control aesthetic impacts, if any:**

None.

11. Light and Glare

a. **What type of light or glare will the proposal produce? What time of day would it mainly occur?**

None.

b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

No.

c. **What existing off-site sources of light or glare may affect your proposal?**

None.

d. **Proposed measures to reduce or control light and glare impacts, if any:**

None.

TO BE COMPLETED BY APPLICANT

EVALUATIONS FOR AGENCY USE ONLY

12. Recreation

a. **What designated and informal recreational opportunities are in the immediate vicinity?**

None.

b. **Would the proposed project displace any existing recreational uses? If so, describe.**

No.

c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any?**

None.

13. Historic and Cultural Preservation

a. **Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.**

No places or objects listed on, or proposed for, national, state, or local preservation registers are known to be on or next to the 324 Building. The 324 Building is listed in the Programmatic Agreement among the U.S. Department of Energy Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site (Programmatic Agreement, DOE/RL-96-77, Rev. 0). The 324 Building is eligible for inclusion in the National Register of Historic Places under criterion A as a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District with no individual documentation required as stipulated in Appendix C, Table 3, of the Programmatic Agreement. A final walkthrough of the 324 Building will be conducted by staff of the Hanford Cultural Resources Laboratory before closure activities are completed.

b. **Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.**

There are no known archaeological, historical, or Native American religious sites in the 324 Building area.

TO BE COMPLETED BY APPLICANT | **EVALUATIONS FOR AGENCY USE ONLY**

c. Proposed measures to reduce or control impacts, if any:

None.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Does not apply.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

No. The distance to the nearest public transit stop is approximately 5 kilometers, located at Washington State University Tri-Cities.

c. How many parking spaces would the completed project have? How many would the project eliminate?

Not applicable.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

No additional vehicular traffic will be required.

g. Proposed measures to reduce or control transportation impacts, if any:

None.

TO BE COMPLETED BY APPLICANT	EVALUATIONS FOR AGENCY USE ONLY

15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any:

Does not apply.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:

Electricity, non-potable water, potable water, Local Area Network (LAN), refuse service, telephone, and a sanitary sewer system are available at the 324 Building.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Existing utilities at the 324 Building would be used to support the closure activities.

SIGNATURES

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

______________________________ ______________________
Keith A. Klein, Manager Date
U.S. Department of Energy
Richland Operations Office

ENCLOSURE 3

Notice of Deficiency (NOD) Comments Resolution Table for the *324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan,* DOE/RL-96-73

Draft Notice of Deficiency (NOD) #2
324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan
DOE/RL-96-73, Revision 2, submitted May 11, 2005

Prepared by J. Wallace, June 2005

Comment Number	Comment
	Chapter 1
1.	For clarification, in evaluating the January 2004 revision 1A of the closure plan application a deficiency was documented and communicated in the Notice of Deficiency (NOD) Comments Response Table for the 324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan, DOE/RL-96-73, Rev 1A (renumbered as formal Revision 2 per comment NOD no. 1) including Comment Resolutions March 09, 2005 was enclosed with the May 11, 2005 submittal of 324 Building Radiochemical Engineering Cells, High-Level Vault, Low-Level Vault, and Associated Areas Closure Plan. New information not presented in the January 29, 2004 closure plan application was inserted into the revised closure plan application submitted May 11, 2005. The May 2005 application was to have been revised in accordance with the Notice of Deficiency (NOD) Table and agreements reached during NOD workshops. The new information changed conditions outside the scope of revision and were changed without informing or receiving concurrence from Ecology. The text was changed after submitting what should have been a true, accurate and complete application dated January 29, 2004. The revision of text occurred without approval or notification of the Washington State Department of Ecology. The only changes to the closure plan should have reflected those documented in the NOD Comment Response Table. See Figure 6-2 Closure Process Flowchart of the Hanford Federal Facility Agreement and Consent Order. In an effort to avoid multiple Notice of Deficiency cycles in revision of the 324 closure plan Ecology provided concise direction in a December 18, 2002 correspondence and then held multiple workshops with the permittee. The workshops allowed Ecology and the regulated party to discuss and develop appropriate responses to comments as well as closure plan text. After conducting an extended and resource intense workshop cycle Ecology discovered that further changes were made without prior notification of Ecology. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, wording is being revised as appropriate for submittal of Revision 3 of the closure plan to Ecology. Wording changes from the July/August 2005 workshop meetings have been provided in redline/strikeout format and are incorporated into the resolutions in this NOD table. Comment resolution status: Closed effective 8/31/05.
2.	Newly inserted closure plan text is inconsistent with Table 6-1, Revision 2 as well as Ecology guidance to the US DOE. Table 6-1 was developed by Ecology revising Table 6-1 contained in revision 1 of the closure plan in a December 18, 2002, letter to Department Of Energy Director, Joel Hebdon from Fredrick Bond, Project Manager. Ecology's intent was to provide clear direction to revise the text of the closure plan to be consistent with standards and actions specified in the revised Table 6-1.

Excerpt from Table 6-1 Addressing Soil/Groundwater.
Closure Performance Standards and Activities for Areas Undergoing Closure.

Area	Components	Closure Performance Standard	Closure Activities
Soil/ Ground-water	Potentially contaminated soil	• Localized soil contamination (if any) will be removed to clean closure standards. • Wide-spread soil contamination will be coordinated with the soil and ground remediation planned for the CERCLA operable units.	• Potentially contaminated soil will be characterized to define nature and extent of contamination. • Localized contamination will be removed and disposed of as mixed waste. • For wide-spread contamination, a contaminant of concern list will be developed so that future CERCLA investigation and cleanup actions can be coordinated.

* Detailed description of the closure actions and activities are included in Chapter 7.0.
* Closure of components will be achieved through removal. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of

	WAC 173-303. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, Table 6-1 has been modified as appropriate for submittal of Revision 3 of the closure plan to Ecology. The soil/groundwater sections of Table 6-1 has been revised to be as follows: <table><tr><td>Area</td><td>Components</td><td>Closure Performance Standard</td><td>Closure Activities</td></tr><tr><td>Soil/ Ground-water</td><td>Potentially contaminated soil</td><td>• Localized soil contamination removal.</td><td>• Remove soil to a depth of 0.5 m under the TSD unit footprint.</td></tr></table> Comment resolution status: Closed effective 8/31/05.
3.	Certification Statement in the front of the document. The certification statement is not compliant with the Dangerous Waste Regulations requirements for documents to be certified in accordance with WAC 173-303-810(13) Certification. (a) Except as provided in (b) of this subsection, any person signing the documents required under (a) or (b) of subsection (12) of this section must make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." In addition, all closure activities must be conducted and certified in accordance with the approved closure plan as stated in the December 18, 2002, letter to Department Of Energy Director, Joel Hebdon, from Fredrick Bond, Project Manager. Please replace statement with the certification language provided. Comment resolution: To be developed. Comment resolution status: Review in progress
4.	The statement 'including regulatory approvals of close out documentation' occurs throughout document; pages 1-6, 1-8, ... The statements do not specify the approving entity. However in section 6.1 more appropriate and preferred language is used "... and including *obtaining* EPA and/or Ecology approval of the appropriate project closeout documents ...". Please insert "obtaining" between "including" and "regulatory" into the less clear statements throughout the application. Comment resolution: The word "obtaining" has been inserted as requested by the comment. Comment resolution status: Closed effective 8/31/05.
5.	Section 2.4. The Security Information section 2.4 describes the requirements as current as of *March 1998*. Please verify that this information is current as of March 2005 and insert the date of the application revision. This comment was not made in review of the original plan because it was outside the scope of revision. However the document should contain current information when it is issued. Comment resolution: Change date to March 2005 per comment in submittal of Revision 3 of the closure plan to Ecology. Comment resolution status: Closed effective 8/31/05.
6.	Throughout the document detail was removed from figures making them less useful. Due to security reasons it may be appropriate to remove the detail however it is inappropriate to do this without communicating the changes. In addition the quality of the photograph copies are so poor they are virtually useless. For example figures 2-8, 2-11, 2-12, and 2-13. Ecology requests clarification of why detail was removed from the document. Please provide actual photographs and detailed figures rather than copies for official use only. This comment was not made in review of the original plan because the modified figures were not provided in the application for revision. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, figures have been reviewed as necessary. Photographs have been located and are being inserted to make new figures for figures 2-8, 2-11, 2-12, and 2-13, and will be included in the submittal of Revision 3 of the closure plan to Ecology. Comment resolution status: Closed effective 8/31/05.

7.	Page 6-2 contains a sentence stating that EPA will approve *any* CERCLA activities. This is an accurate statement but for clarification, closure activities, including those performed in conjunction with CERCLA activities will be approved by Ecology. This point of clarification would be appropriate for the application. Ecology must oversee closure activities in order to approve the closure certification that actions are conducted in accordance with the approved closure plan. This responsibility is not deferrable to CERCLA. Comment resolution: Insert sentence at end of the subject comment sentence paragraph stating "Closure activities, including those performed in conjunction with CERCLA activities will be approved by Ecology." Include in submittal of Revision 3 of the closure plan to Ecology. Comment resolution status: Closed effective 8/31/05.

8.	Section 6.2.5 addresses the closure strategy for the underlying soils and groundwater. The May 2005 version of this section contains text that was not submitted or discussed in what should have been true, accurate and complete application dated January 29, 2004. The changes to the text occurred without approval or notification of the Washington State Department of Ecology. The only changes to the closure plan should have reflected those documented in the NOD Response Table. See Figure 6-2 Closure Process Flowchart of the Hanford Federal Facility Agreement and Consent Order.
	
	In an effort to avoid multiple NOD cycles in revision of the 324 closure plan Ecology provided concise direction in a December 18, 2002 correspondence and then held multiple workshops with the permittee. The workshops allowed Ecology and the regulated party to discuss and develop appropriate responses to comments as well as closure plan text. After conducting such an extended and resource intensive workshop cycle Ecology is very disappointed that further changes were made without informing Ecology.
	
	The following is the text modifications presented and agreed to by Ecology through the workshop process. The changes are highlighted. Note the clean closure standards text was not modified;
	
	"6.2.5 Underlying Soils and Groundwater
	
	The closure strategy for the soils and/or groundwater potentially contaminated with dangerous wastes from TSD operations is provided in Figure 6-5. The following closure activities will be performed to close the unit with respect to soils and groundwater:
	
	• Prepare a sampling and analysis plan for soil sampling for Ecology approval. Submit sampling plan to Ecology 180 days prior to planned implementation of sampling to allow for Ecology review and approval prior in advance of sampling. Soil sampling requirements are addressed in section 7.5.2.
	• Clean closure standards for soil are the numeric cleanup levels calculated using the residential exposure assumptions according to the Model Toxics Control Act (MTCA) Method B (WAC 173-340). Where no cleanup values can be calculated using MTCA Method B, the values in the MTCA Method A table can be used, as appropriate.
	• If no dangerous waste is found above MTCA levels, the area can be closed with respect to the closure of this unit. If dangerous waste is identified above the standard, the following actions will be taken.
	    - If concentrations or conditions warrant an interim measure for soil removal, an Interim Measures Plan will be prepared and submitted to ecology for the removal.
	    - If an interim measure is not warranted, soil investigations and remediation will be scheduled and coordinated with the CERCLA operable unit, identifying the contaminants of concern, cleanup levels and specifying RCRA as an ARAR. (Note: The current 300-FF-2 operable unit remediation strategy is to use industrial cleanup standards [MTCA Method C] consistent with the 300-FF-1 Final Record of Decision.)"
	
	Revision 0, revision 1, and the January 29, 2004 application revision 1A of the 324 closure plan submitted contained the following bulleted text in section 6.5 of the closure plan;
	
	"Clean closure standards for soil are the numeric cleanup levels calculated using the residential exposure assumptions according to the Model Toxics Control Act (MTCA) Method B (WAC 173-340). Where no cleanup values can be calculated using MTCA Method B, the values in the MTCA Method A table can be used, as appropriate. The second bullet stated if no dangerous waste is found above MTCA cleanup levels ...".
	
	The redline/strikeout version of the text Ecology was provided for resolution of the NOD associated with section 6.5 and subsequently approved consisted of replacing the first two bullets in section 6.5 with one bullet that read;

Page 265 of 295 of DA01225050

"Prepare a sampling and analysis plan for soil sampling for Ecology approval. Submit sampling plan to Ecology 180 days prior to planned implementation of sampling to allow for Ecology review and approval prior in advance of sampling. Soil sampling requirements are addressed in section 7.5.2." No changes were proposed for the rest of this section.

However when the draft application was submitted May 11, 2006 to prepare for issuance other portions of section 6.5 were modified. In addition, to the agreed to changes to the text, the bullet presenting clean closure standards was deleted and the acronym "MTCA" was replaced "land use cleanup" in the last bullet.

Please revise text to use approved text presented originally in Revision 0, 1, 1A, and the workshops as presented above.

Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, the closure strategy consists of removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Pre-existing soil contamination deeper than 0.5 meters below ground surface and groundwater contamination will be addressed through 300 Area CERCLA response actions. Accordingly, Section 5 is being revised as appropriate for submittal of Revision 3 of the closure plan to Ecology. Based on the July/August 2005 workshop meetings, Sections 5.0, 5.1, 5.4, and Section 6.2.5 have been reworded to read as follows:

5.0 GROUNDWATER MONITORING

Closure of the 324 Building TSD unit will include removal of the REC unit components (Table 2-1) and removal of soil to a depth of 0.5 meter (m) below the TSD unit footprint. Closure surveillance and maintenance of the 324 Building will be required as addressed in Chapter 8.0. Groundwater monitoring and reporting will be included as part of the 300-FF-5 operable unit (OU).

5.1 BACKGROUND

Information on the groundwater monitoring for the Hanford Site is provided in annual reports (e.g., PNNL-11470). The geologic and hydrogeologic information provided in this chapter is summarized from the PNNL report.

The geology and hydrogeology of the 300 Area is well characterized and the groundwater is monitored through an extensive well network collecting data to meet the requirements of the RCRA, CERCLA, and Atomic Energy Act. Groundwater monitoring is conducted by DOE-RL and its contractor. In accordance with the Tri-Party Agreement, groundwater in the 300 Area is included in the 300-FF-5 OU and is being investigated as part of the CERCLA Remedial Investigation/Feasibility Study process. The only constituents detected in the groundwater beneath the 324 Building in levels greater than the proposed interim drinking water standards are uranium and sometimes strontium-90. The 300-FF-5 OU consists of the aquifers beneath the 300-FF-01 and 300-FF-2 source OU and is bounded by the Columbia River on the east (Figure 5-1).

Groundwater for the 324 Building is addressed in the 300-FF-5 groundwater OU (Figure 5-1). A combined Record of Decision was issued in July 1996 for the 300-FF-1 OU (final) and the 300-FF-5 OU (interim). Actual or threatened releases from the 300-FF-2 OU waste sites to the groundwater are addressed in a future Record of Decision and will include coordination between CERCLA and RCRA (DOE/RL-89-14, DOE.RL-93-21, DOE/RL-94-85).

5.4 CONCLUSION

There are soil and groundwater contamination from past-practice activities in the vicinity of the 324 Building (e.g., the 618-6 Burial Ground). Past-practice activities have contributed to contamination throughout the Hanford Site. Because of overlapping authorities, the TPA requires coordination by regulatory authorities. Specifically, in cases where TSD unit components are located within an existing operable unit to be remediated pursuant to either CERCLA or RCRA corrective action, integration is to be accomplished through coordination of some or all aspects of closure as might be appropriate.

It is recommended to coordinate cleanup of any contaminated soil and groundwater as a result of the TSD activities in this closure plan with the TPA past-practice process because: (1) integration of cleanup is required by the TPA to prevent duplication of work and to economically and effectively address contamination, (2) applicable standards would not be circumvented by coordination, (3) Ecology would not lose authority over coordination, (4) protection of human health and the environment would not be jeopardized by coordination, (5) the approach is legally defensible, and (6) there is no evidence of and limited potential for soil or groundwater contamination from TSD activities at the 324 Building. This coordination of cleanup activities is described in Chapter 7.0, Section 7.5 and Chapter 8.0, Section 8.3.

Section 6.3.1 of the Tri-Party Agreement states, "Any demonstration for clean closure of a disposal unit, or selected treatment or storage units as determined by the lead regulatory agency, must include documentation that groundwater and soils have not been adversely impacted by that TSD group/unit, as described in WAC 173-303-645 (Ecology, et al., 1996)." The 324 Building housed mixed waste in the REC, HLV, and LLV; however, it is believed that none of this dangerous waste escaped the 324 Building to reach the soil or groundwater. If closure of the soil and groundwater cannot be accomplished as described in Chapter 7.0, surveillance and maintenance requirements will be established (as described in Chapter 8.0) prior to coordination of final cleanup with the TPA past-practice operable unit.

6.2.5 Underlying Soils and Groundwater

Soil and groundwater contamination existed prior to the operations of the 324 Building TSD unit. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing soil and groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

Sections 6.0 through 6.2.4.5 have been reworded to read as follows:

6.0 CLOSURE STRATEGY AND PERFORMANCE STANDARDS

This chapter discusses the closure strategy and performance standards that will be used to close the 324 REC HLV/LLV.

As addressed in Section 1.3.2, Milestone M-094-03 requires complete disposition of the 324 Building, and the closure strategy and closure performance standard has changed to "removal" of the mixed waste unit components instead of cleaning to meet the Debris Rule "clean debris surface" standard for clean closure. All dangerous and/or mixed waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during closure activities will be handled in accordance with all applicable requirements of WAC 173-303. Because of the complexity and significant radiological contamination of the 324 Building closure unit, closure actions will be closely integrated with the overall facility deactivation and disposition activities. This integration process is described in Chapter 1.0, Section 1.5. The approach illustrated in Chapter 7.0 provides a mechanism for quickly and efficiently addressing issues as they arise during the implementation of closure activities, to minimize the overall impact to the closure schedule. This approach to contingency planning may lead to amending the closure plan and is discussed in greater detail in Chapter 7.0, Section 7.8. This approach provides a proactive method for identifying, evaluating, and acting on necessary changes that could affect closure activities. Such changes could occur, based on changing site conditions that affect personnel protection and safety, nuclear safety, waste generation rates, and/or technology limitations or advances. These changing site conditions will become apparent as work progresses and individual closure actions are accomplished.

6.1 CLOSURE STRATEGY

Closure actions described in the following sections will involve the storage and treatment of dangerous waste during the waste removal and decontamination steps. After the areas within the 324 Building have been closed, these areas will no longer be used for treatment and storage of dangerous waste. However, these areas may be used as necessary to support deactivation activities. These potential future uses could include nondangerous waste activities and generator status dangerous waste activities.

After final building disposition, the appearance of the land where the 324 Building is located will be consistent with the appearance and future use of the surrounding land areas. Milestone M-094-03 (addressed in Chapter 1, Section 1.3.2) requires the complete disposition of the 324 Building. Future land use decisions will be considered during the 324 Building decommissioning process. The final disposition of the building and the appearance and use of the land areas will be integrated with the surrounding 300 Area.

The closure performance standards and closure activities for each of the closure areas and components are described in the following sections. Table 6-1 provides a summary of these standards and actions for each closure area. Table 6-1 reflects the effect of Milestone M-094-03, which requires the complete disposition of the 324 Building and has consequently changed the closure strategy and closure performance standard to "removal" of the mixed waste unit components instead of cleaning to meet the Debris Rule "clean debris surface" standard. All dangerous and/or mixed waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during closure activities will be handled in accordance with all applicable requirements of WAC 173-303. The closure actions are depicted in the closure strategy flow diagrams (Figure 6-1 through Figure 6-3). Figure 6-1 provides the closure strategy for the areas in which nonpermitted TSD operations occurred. Figure 6-2 provides the closure strategy for the piping systems associated with the TSD operations and the support areas.

Clean closure will be achieved by removal of the TSD portions of the 324 Building, as described in this closure plan. However where clean closure is not possible, closure surveillance and maintenance activities will be implemented according to Chapter 8.0 of this closure plan. Completion of facility disposition is defined by TPA Change Number M-094-01-01 as the completion of deactivation, decontamination, and decommissioning (including demolition), and including obtaining EPA and/or Ecology approval of the appropriate project closeout documents. Surveillance and maintenance will be performed as required to maintain safe operations during facility deactivation and removal per Chapter 8.0. The portions of the 324 Building comprising the closure unit include the REC (B-Cell, D-Cell, airlock, pipe trench, cell cubicles, and pass-through ports); HLV and tanks; LLV and tanks; piping; and associated building areas (HLV sample room, EDL-146, truck lock, cask handling area, galleries, and Room 18).

Future actions for building areas outside the closure unit boundary (as defined in Chapter 2.0) or within the boundary (with respect to contamination that was not a result of use of these areas for treatment or storage of dangerous waste) are outside the scope of this closure plan and will be performed as part of the building deactivation and disposition process. Components which meet the closure requirements but may have residual radiological contamination (e.g., liners, embedded piping, structures, etc.) will be formally dispositioned during building deactivation and final building removal. All dangerous and/or mixed/waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

After the waste inventory and equipment are removed, closure of the REC, HLV and LLV, piping, and associated areas will be accomplished by removal activities integrated with facility disposition activities as outlined in the closure plan.

The closure of this unit will be completed by removing the liners, tanks, and piping that contained or handled the dangerous waste contaminants addressed in this closure plan. Closure activities will include removal of soil to a depth of 0.5 m under the TSD unit footprint. Closure activities are not to be compromised or otherwise circumvented due to integration with other remedial activities. All noncompliances or deviations from actions specified in the Closure Plan are to be reported to Ecology. Applicable or relevant and appropriate requirements will be developed for TSD closure activities conducted in conjunction with CERCLA remedial actions, and are subject to review and approval by Ecology. Any CERCLA actions are subject to review and approval by EPA. Closure activities including those performed in conjunction with CERCLA activities will be approved by Ecology.

This chapter discusses the strategy for closure of the 324 REC/HLV. However, if a change in strategy occurs before closure is completed and is agreed to and approved by Ecology, the closure plan will be revised and the new strategy will be employed and documented as described in Chapter 7.0, Section 7.8.

6.2 CLOSURE PERFORMANCE STANDARDS

Closure, as provided for in this plan, will be conducted in accordance with WAC 173-303-610. For all structures, equipment, bases, liners, etc., clean closure standards are set by Ecology on a case-by-case basis in accordance with the closure performance standards of WAC 173-303-610(2) and in a manner that minimizes or eliminates postclosure escape of dangerous waste constituents. Closure performance standards require the owner or operator to close the building in a manner that: minimizes the need for further maintenance; controls, minimizes, or eliminates (to the extent necessary to protect human health and the environment) postclosure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere; and return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity. Closure performance standards for the actions proposed for each of the areas and components identified in the closure boundary are provided in the succeeding sections.

The closure standards will be "removal" for cell liners and concrete. The closure of this unit will be completed by removing the liners, tanks, and piping components that contained and/or handled the dangerous waste contaminants addressed in this closure plan. All dangerous and/or mixed-waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

Closure performance standards for various components are discussed in the following sections.

6.2.1 Radiochemical Engineering Cells

The closure strategy for the REC Cells is provided in a logic flow diagram (Figure 6-1). Removal activities may include alternative methologies (e.g., grouting and removal of monolithic structures). The sequence of activities may be worked in sequence different than presented in the following.

6.2.1.1 A-Cell

A-Cell was not used for TSD activities; therefore, there are no specific closure activities required. However, piping between B-Cell and the HLV tanks passes under A-Cell in a crawl space and piping will be removed or isolated as described in Section 6.2.3.

6.2.1.2 B-Cell

Components requiring closure within B-Cell include the cell contents (excess equipment, debris, and dispersibles), liner, and concrete. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

- All dangerous and mixed waste inventory will be removed.
- All in-cell excess equipment was removed, designated, and disposed as part of Tri-Party Agreement Milestone M-89-02.
- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303
- The liner and concrete will be removed
- The closure of this unit will be completed by removing the liners, tanks, and piping that contained and/or handled the dangerous waste contaminants addressed in this closure plan. Closure activities will include removal of soil to a depth of 0.5 m under the TSD unit footprint.

6.2.1.3 C-Cell

C-Cell was not used for the TSD activities; therefore there are no specific closure activities required.

6.2.1.4 D-Cell

General closure activities for the REC D-Cell will be as follows:

- Remove, designate, and dispose of all HLV clean-out equipment, associated utilities, and residual waste (after the equipment and materials are no longer being used to support the closure and deactivation activities).
- Remove liner and concrete. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.
- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.1.5 Airlock

The closure component for the airlock is the dangerous waste piping. Dangerous waste piping will be closed by performing removal of the piping.

6.2.1.6 Pipe Trench

Components requiring closure within the pipe trench include the piping in the trench, any potentially mixed waste debris in the trench, and the concrete. The following closure activities must be performed to close the pipe trench.

- All debris and sludge will be removed, designated and disposed.
- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.1.7 Other Radiochemical Engineering Cell Components

Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.2 High-Level Vault and Low-Level Vault

The tanks within the HLV and LLV will be removed and disposed, and the vault liners will be removed. Because of the high-radiation levels associated with the tanks, alternative removal methods and/or closure actions may be required. Chapter 7.0 provides a process for contingency planning that will be used to deal with changing conditions as they develop. The closure of this unit will be completed by removing the liners, tanks, and piping that contained and/or handled the dangerous waste contaminants addressed in this closure plan.

The HLV tanks will be removed. The LLV and tanks may remain operational, as necessary, to support closure deactivation activities, and then will be removed and disposed to achieve closure, consistent with the closure strategy for the HLV and LLV in Figure 6-1. The vault liners will be removed.

6.2.2.1 High-Level Vault

Components requiring closure within the HLV include the vault contents (tanks, ancillary equipment, piping, and residual wastes), the liner, and potentially the concrete. Following are the closure activities for the HLV:

- Any remaining dangerous and mixed waste inventory (i.e., tank heels) will be removed. The mixed waste tank liquid inventory that was removed in 1996 as part of the 324 HLV interim waste removal action is described in Chapter 3.0, Section 3.3.1.5.
- The tanks and ancillary equipment will be removed and size reduced as necessary; designated as waste; and disposed at an appropriate waste management and/or TSD unit.
- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.
- The liner will be removed, designated, and disposed. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.
- Walls and floor of the vault will be removed.

6.2.2.2 Low-Level Vault

Components requiring closure within the LLV include the vault contents (tanks, ancillary equipment, piping, and residual waste), the liner, and the concrete. The closure activities planned for the LLV are the same as those required for the HLV (Section 6.2.2.1).

6.2.2.3 Sample Room (Room 145)

Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.3 Piping Systems

Components requiring closure within the piping system include all piping runs used to carry dangerous wastes between the REC Cells and vault tanks. The closure strategy for the piping system is provided in Figure 6-2. Following are the closure activities for the piping system:

- Identify piping that could have transported dangerous waste. Only piping that transported dangerous waste to or from an area within the closure boundary is within the scope of this closure plan.
- The closure process will include removal of all piping. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4 Other 324 Building Areas within the Closure Boundary

General closure activities for the miscellaneous associated building areas will be to remove all piping runs that were used to carry dangerous waste between the REC Cells and vault tanks. The closure strategy for piping is removal. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.1 Cask Handling Area

The cask handling area was not used for TSD activities; therefore there are no specific closure activities required.

6.2.4.2 Truck Lock

The closure component for the Truck Lock is the dangerous waste piping. Dangerous waste piping will be closed by removal in accordance with the closure plan standards. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.3 Engineering Department Laboratory-146

The closure component for the EDL-146 is the dangerous waste piping. Dangerous waste piping will be closed by removal in accordance with the closure plan standards discussed in Section 6.2.3. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.4 Operating Galleries

The closure component for the galleries is the dangerous waste piping. Dangerous waste piping will be closed by removal in accordance with the closure plan standards discussed in Section 6.2.3. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

6.2.4.5 Room 18

The closure components for Room 18 are the dangerous waste piping and the potential concrete surrounding the B-Cell service plugs. General closure activities for Room 18 will be as follows:

- Piping will be removed to achieve closure. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.
- Remove concrete in the same manner as B-Cell.

	Comment resolution status: Closed effective 8/31/05.
7.	7.5.2, page 7-8, line 43 and 44. During the NOD workshops it was agreed that "conducted over these accessible soil areas" was to be deleted from line 43 because the entire building is being removed to allow unobstructed access to the soil beneath the building. Please revise text accordingly. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, the closure strategy consists of removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Pre-existing soil contamination deeper than 0.5 meters below ground surface and groundwater contamination will be addressed through 300 Area CERCLA response actions. Based on the July/August 2005 workshop meetings, Sections 7.5.1 through 7.5.4 have been deleted, and Sections 7.0 through 7.7 have been reworded to read as follows: **7.0 CLOSURE ACTIVITIES** Closure will be pursued for the TSD portions of the 324 Building. As addressed in Chapter 6.0 and presented in Table 6-1, the closure strategy and closure performance standard has changed to "removal". If closure to the planned closure performance standards is not attainable, closure surveillance and maintenance will be implemented in accordance with Chapter 8.0. This chapter discusses the activities that are necessary to implement this closure strategy. Figure 7-1 provides the approach for dealing with changing site conditions, including potential contingency plans. Waste removal activities conducted, in accordance with the consent order of M-89-01 and M-89-02, are described in Chapter 3.0. All work will be performed to maintain personnel exposure to dangerous and/or mixed waste, radioactivity, hazardous chemicals, or any other workplace hazard ALARA. Some work activities will be performed remotely because of ALARA concerns. Detailed records, including daily log books, and in some activities video logs, will be maintained for closure actions, including waste removal and management activities, component decontamination, and all other activities proceeding to closure of the unit. Because of the complexity and significant radiological contamination of the 324 Building TSD unit, closure actions will be closely integrated with the overall deactivation and disposition activities. This integration process is described in detail in Chapter 1.0, Section 1.5. The approach, illustrated in Chapter 7.0, provides a mechanism during the implementation of closure activities to quickly and efficiently address issues as they arise, thereby minimizing the overall impact to the closure schedule. This approach to contingency planning could lead to amending the closure plan discussed in greater detail in Section 7.7. This approach provides a proactive method for identifying, evaluating, and acting on necessary changes that could affect closure activities. Such changes could occur, based on changing site conditions that affect personnel protection and safety, nuclear safety, waste generation rates, and/or technology limitations or advances. These changing site conditions will become apparent as work progresses and individual closure actions are accomplished. Documentation of closure activities will include an independent professional engineer or equivalent certificate of completion. Closure activities will be documented in a formal manner using operations logbooks or equivalent documentation consistent with supporting the required professional engineering certification and documentation of closure activities. Per WAC 173-303-380 (Facility recordkeeping), the facility operating record documentation will include records and results of waste analyses and waste determinations. Per WAC 173-303-610(6), documentation supporting the independent registered professional engineer's certification of closure of the mixed waste units must be furnished to Ecology upon request. Closure activities documentation (e.g., logbooks and documentation referenced in logbooks, inspection checklists, videos, and photographs) shall be protected and maintained until final closure is obtained. All documentation supporting closure shall be protected and maintained in retrievable storage through completion of closure of the 324 Building REC mixed waste units and as applicable for post-closure. Copies of this documentation will be made available to Ecology upon request. Any sampling and analysis plans generated as a result of this closure plan will be included or referenced. **7.1 CLOSURE ACTIVITIES FOR RADIOCHEMICAL ENGINEERING CELLS** The REC consists of the A-Cell, B-Cell, C-Cell, D-Cell, the airlock, the pipe trench, and the cell cubicles and pass-through ports. Closure of B-Cell, D-Cell, and the pipe trench will entail removal, as indicated in Chapter 6.0, Table 6-1. The airlock, cell cubicles, and pass-through ports will be closed by removing dangerous waste pipes from the HLV. A-Cell and C-Cell were not used for TSD activities, and therefore, no closure activities are identified for these areas.

7.1.1 Closure Activities for A-Cell

A-Cell was not used for TSD activities; therefore, there are no specific closure activities identified for A-Cell in this closure plan.

7.1.2 Closure Activities for B-Cell

B-Cell Closure Activities include, (1) Removal of equipment and radiological contaminated dispersible debris in B-Cell (completed through Tri-Party Agreement M-89-02 activities), (2) B-Cell cleaning (decontamination as necessary to remove residual material), and (3) removal of the liner and concrete. Waste will be designated and managed as described in Section 7.6. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

7.1.2.1 B-Cell Equipment and Waste Removal

The B-Cell waste removal activities (completed through M-89-02 activities) included removing and disposing of the equipment and racks within B-Cell, including handling equipment, such as cell bridge cranes and in-cell ends of the manipulators; and solid waste collection vessels, such as 208-liter waste containers; Tank 119, and engineered containers. Equipment and racks were rinsed as appropriate to remove dispersible material, size reduced, and loaded into steel liners. Some material required special handling because of anticipated high dose rates.

After equipment racks were removed, the potentially dispersible material on the floor was collected and containerized. This material, which was considered mixed waste and special-case waste, was sampled, characterized, and removed from B-Cell to an appropriate TSD unit.

Closure of dangerous waste issues associated with B-Cell required removal of materials and equipment from B-Cell. Most of the material and equipment in the cell, with the exception of process auxiliary tanks and piping systems, were not dangerous waste or dangerous waste components. Effective mitigation of dangerous waste hazards in B-Cell depended upon completion of the waste removal activities.

7.1.2.2 B-Cell Cleaning

The closure strategy (Chapter 6.0, Table 6-1) for B-Cell involves the removal of mixed waste, equipment, and the liner and surrounding concrete. Some cleaning may be performed for waste management or radiological work management reasons associated with 324 Building deactivation and disposition. There are four primary cleaning methods that could be used to clean the surface of B-Cell: (1) wet wipe down of walls and floors, (2) dry alkaline foam wash, (3) water wash and hot spot cleaning, and (4) oxidation coating removal using chemical extraction processes. Some cleaning may be performed due to dose rate reduction, waste packaging, or facility demolition/engineering considerations. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303. Each method or process could be used more than once or discontinued if proven ineffective. In addition, other methods (such as abrasive blasting or high pressure steam and water sprays) also might be considered if shown to be advantageous from an effectiveness, personnel protection, or waste minimization standpoint. Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303.

7.1.2.3 B-Cell Floor Liner Removal

Removal of the B-Cell liner will be performed to meet the closure performance standard.

7.1.2.4 Remove B-Cell Liner and Concrete

The liner will be removed, designated, and disposed of in accordance with WAC 173-303.

7.1.2.5 Liquid Waste Handling System (LWHS) Operations in B-Cell

The LWHS may be used as needed in B-Cell for removal of water by evaporation for liquid waste solutions generated from 324 Building REC closure and/or decontamination activities. The system will be located in B-Cell and will handle water solutions and perform drying/evaporation, with collection of solids for waste disposed in waste containers. The LWHS would be operated remotely in B-Cell. Any spills would be documented in an operations logbook or equivalent method. Repairs and/or necessary equipment modification will be documented. The walls, floors, and liners of B-Cell and of the 324 Building provide protection of the environment should any spills occur. When no longer needed to support facility deactivation closure activities, the LWHS equipment will be removed, designated, and disposed.

7.1.3 Closure Activities for C-Cell

C-Cell was not used for TSD activities; therefore, there are no specific closure activities identified for C-Cell in this closure plan.

7.1.4 Closure Activities for D-Cell

Closure activities for D-Cell (Chapter 6.0, Table 6-1) include removal of equipment, waste, piping, liner, and concrete. Closure of D-Cell will include removal of the waste inventory and the equipment used for the processing of the HLV tank liquid waste.

The HLV liquid waste treatment equipment has been emptied and rinsed. The treatment skid has been disassembled. After this equipment is no longer needed to support closure activities, the equipment will be removed from D-Cell and disposed as waste.

7.1.4.1 D-Cell Removal

Closure activities for D-Cell (Chapter 6.0, Table 6-1) include removal of equipment, waste, piping, liner, and concrete.

7.1.4.2 Remove D-Cell Liner and Concrete

The liner and underlying concrete surfaces will be removed.

7.1.5 Closure Activities for the Airlock

The closure activities for the airlock are all associated with the dangerous waste piping. Dangerous waste piping closure activities are addressed under the closure activities for the piping, Section 7.3.

7.1.6 Closure Activities for the Pipe Trench

The pipe trench closure activities include removal of piping, waste/debris, and the pipe trench and concrete. Waste materials generated during these activities will be properly designated and dispostioned at an acceptable waste management facility.

7.1.6.1 Pipe Trench Pipe Removal

As described in Section 6.2.3, the sequence of piping removal will be closely integrated with all closure and deactivation activities so that piping needed to support closure and decontamination operations is left in place until such operations are completed.

Piping will be removed as practicable, designated, and packaged. Embedded piping will be removed.

7.1.6.2 Pipe Trench Initial Cleanout and Decontamination

Sludge and debris in the pipe trench was collected, designated, and transferred to a Hanford Site waste management facility. The pipe trench was decontaminated to remove the bulk of the sludge. Decontamination residues were collected, designated, and managed as described in Section 7.6. Pipe trench residual material or sludge was managed as dangerous waste. The pipe trench will be removed, designated, and packaged.

7.1.7 Closure Activities for other REC Components

The closure activities for the other REC components such as the cell cubicles and pass-through ports are all associated with the dangerous waste piping. Dangerous waste piping closure activities are described in Section 7.3.

7.2 CLOSURE ACTIVITIES FOR THE HIGH-LEVEL VAULT AND LOW-LEVEL VAULT

The HLV and LLV each consist of four tanks, the vault liner and concrete, and the piping and ancillary equipment in the vault. All dangerous and mixed waste inventory will be removed with the HLV tank system. In 1996, the HLV and LLV tanks were emptied and the HLV tanks flushed to satisfy Tri-Party Agreement Milestone M-89-01 (Chapter 3.0, Section 3.3). Closure of the HLV and LLV entails removing the tanks, piping, liner, and concrete. Closure activities for the HLV are described in Section 7.2.1. The LLV and tanks may remain operational, as necessary, to support deactivation and closure activities, and then will be removed and disposed to achieve closure.

7.2.1 Closure Activities for the High-Level Vault

Waste removal and flushing activities that were performed in accordance with the M-89-01 Milestone are described in Chapter 3.0, Section 3.3.9.

7.2.1.1 Tank and Piping Cleaning

If the piping system is to be used during closure activities, piping integrity will be confirmed using pressure tests. The performance standard for the tanks is removal. Residual mixed waste in the tanks and piping systems will be removed with the tank systems. Decontamination waste solutions may processed through a temporary effluent processing system (LWHS, described in Section 7.1.2.5). Solid waste produced will be designated and disposed at an acceptable waste management facility. Waste water will be evaporated using an in-cell system and the collected solid waste appropriately designated and packaged for waste disposal.

7.2.1.2 Tank and Piping Removal

The tanks and piping will be removed, designated, and disposed of accordingly. The following vault contents will be removed to meet closure performance standards and deactivation end-points:

- Accessible piping
- Process tanks
- Remaining piping
- Ventilation ducting
- Pass-through piping.

7.2.1.3 Remove Liner and Concrete

Closure of the TSD unit components will be completed by removing the liners and concrete.

7.2.2 Closure Activities for the Low-Level Vault

The LLV tanks, piping, and liner will be closed in the same manner as the HLV tanks. The following steps will be taken in the same manner as described for the HLV in Section 7.2.1:

- Tank and piping removal
- Removal of the liner and concrete

7.2.3 Closure Activities for the Sample Room (Room 145)

The sample room (Room 145) has piping that connects to the tanks in the HLV and LLV. The piping will be removed as described in Section 7.3.

7.3 CLOSURE ACTIVITIES FOR THE PIPING

Components requiring closure within the piping system include all piping runs that were used to carry dangerous waste constituents between the REC and Vault tanks. Only piping that might have carried dangerous waste constituents will undergo closure activities. These pipes are referred to as 'dangerous waste piping'. However, the piping between the LLV and the Sodium Removal Pilot Plant will be addressed in this closure plan for completeness. The closure strategy for the piping system is provided in a logic flow diagram in Chapter 6.0 (Figure 6-2).

Piping that will undergo closure includes the piping identified in Table 7-1. Table 7-1 identifies all piping associated with the HLV and LLV tanks. This table also identifies which piping requires closure based on their historical use. All other piping will be evaluated during the 324 Building D&D process. Facility deactivation will proceed in parallel with the closure activities as described in Chapter 1.0, Section 1.3. The pipes will be removed. All removed piping will be designated and disposed in accordance with WAC 173-303.

7.3.1 Piping Removal

Piping is to be removed. The closure performance standard will be the removal of all ancillary equipment and piping when that piping is no longer needed to support closure or deactivation activities. Such piping will be removed, designated, and disposed. Piping that is needed to support deactivation or closure activities will be maintained until these closure activities are completed and then removed.

7.3.2 Closure of Embedded Piping

Embedded piping will be removed with the concrete during concrete removal activities.

7.4 CLOSURE ACTIVITIES FOR THE MISCELLANEOUS BUILDING AREAS

Closure of the cask handling area, truck lock, EDL-146, and galleries are described in the following sections. General closure activities for the miscellaneous associated building areas will be to remove all piping runs that were used to carry dangerous waste between the REC and Vault tanks.

7.4.1 Closure Activities for the Cask Handling Area

The cask handling area was not used for TSD activities; therefore, there are no specific closure activities required.

7.4.2 Closure Activities for the Truck Lock

The closure component for the truck lock is the dangerous waste piping. Dangerous waste piping will be closed in accordance with the closure activities discussed in Section 7.3

7.4.3 Closure Activities for the Engineering Laboratory (Room 146)

The closure component for EDL-146 is the dangerous waste piping. Dangerous waste piping will be closed in accordance with the closure activities discussed in Section 7.3.

7.4.4 Closure Activities for the Operating Galleries

The closure component for the galleries is the dangerous waste piping. Dangerous waste piping will be closed in accordance with the closure activities discussed in Section 7.3.

7.4.5 Closure Activities for Room 18

The closure components for Room 18 are the dangerous waste piping and potentially the concrete surrounding the B-Cell service plugs. Dangerous waste piping and service plugs will be removed.

7.5 CLOSURE ACTIVITIES FOR SOIL DIRECTLY BENEATH THE BUILDING

The B-Cell, HLV, and LLV vaults were designed and installed with a system to contain and collect leaks or spills and to channel these to sumps from which the solutions were pumped back into the tank system. The closure of this unit will be completed by removal of TSD unit components. Soil and groundwater contamination existed prior to the operations of the 324 Building. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing soil and groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

age 294 of 295 of DA0824800

	7.6 REGULATED MATERIAL REMOVED DURING CLOSURE Materials that designate as dangerous waste, including decontamination waste, treatment residue, and/or closure debris will be transferred to an onsite approved unit or shipped offsite to a TSD facility. Containers used for transfers of regulated materials to offsite TSD facilities will be U.S. Department of Transportation-approved containers compatible with the waste being transferred (e.g., 208-liter containers). The containers will be labeled and shipped offsite under manifest according to WAC 173-303-180 and WAC 173-303-190 as applicable, or transferred to an onsite approved unit. After designation, waste could be disposed as follows: • Dangerous waste will be transported offsite or to an onsite unit to await final disposal or treatment. • Low-level waste will be disposed onsite in the Low-Level Waste Burial Grounds, or the Environmental Restoration Disposal Facility (ERDF), or other acceptable facility, as applicable, and consistent with disposal facility waste acceptance criteria. • Solid mixed waste will be transferred to the Central Waste Complex, the PUREX Storage Tunnels, or to another permitted TSD Unit. (The PUREX Storage Tunnels were used in the past.) • Closure strategy is to dry liquid mixed waste using LWHS in B-Cell to remove water by evaporation and to collect solids for disposal transfer to CWC. • Nondangerous and nonradioactive solid waste could be disposed offsite. **7.7 SCHEDULE FOR CLOSURE** The closure schedule is presented in Appendix 7A of this closure plan. Removal of inventory from B-Cell, D-Cell, and the HLV already has been completed in accordance with the Tri-Party Agreement milestones M-89-01 and M-89-02 and is reflected in the closure schedule provided in Appendix 7A. Because of the complexity and significant radiological contamination of the 324 Building, the schedule proposed for completion of M-89-00 is greater than 180 days. Closure of the 324 Building mixed waste unit is scheduled to be completed by September 30, 2010. Comment resolution status: Closed effective 8/31/05.
8.	Section 7.5.2, page 7-9, line 14. The acronym MTCA was deleted from the sentence. Please use the text below which was posed by the permittee and agreed to by Ecology in the workshops; "Sampling and analysis for waste management purposes can be conducted simultaneously with that of the components being evaluated for closure. This coordinated sampling and analysis plan must have the capabilities for achieving the detection limits and methodologies for determining both designation limits and MTCA cleanup levels." Please revise text to use approved text presented as stated above. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, the closure strategy consists of removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Pre-existing soil contamination deeper than 0.5 meters below ground surface and groundwater contamination will be addressed through 300 Area CERCLA response actions. Rewording of Chapter 7.0 was addressed in resolution to comment (9). Comment resolution status: Closed effective 8/31/05.
9.	Section 7.5.2, Line 16. This entire paragraph has been modified from that which was provided in 1) the January 2004 application and 2) the negotiated language developed December 2004 redline/strikeout version. The following is language proposed by the permittee and agreed to by Ecology in the workshops; "As addressed in section 6.2.5, and required by WAC 173-303-610(2)(b)(i), the clean closure standards for the soil are the numeric cleanup levels calculated using residential exposure assumptions according to the Model Toxics Control Act (MTCA) Method B (WAC 173-340). Where no cleanup values can be calculated using MTCA Method B, the values in the MTCA Method A table can be used, as appropriate." Please revise text to use approved text presented as stated above. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, the closure strategy consists of removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Pre-existing soil contamination deeper than 0.5 meters below ground

	surface and groundwater contamination will be addressed through 300 Area CERCLA response actions. Rewording of Chapter 7.0 was addressed in resolution to comment (9). Comment resolution status: Closed effective 8/31/05.
10.	Section 7.5.3. The following is language proposed by the permittee in the workshops; January 2004 application language - This plan will describe how the removal will be done, provide cleanup standards *(based on the MTCA clean closure standards for TSD contaminants of concern or approved alternative)*, and specify how sampling will be performed to verify cleanup objectives have been met. This plan will be incorporated into the closure plan, as described in the closure modification requirements contained in Section 7.8. If interim removal actions can be performed to meet the closure performance standards, then the unit will be closed. Without acknowledging or approval changed to; May 11, 2005 application language - This plan will describe how the removal will be done, provide cleanup standards *consistent with the current 300-FF-2 operable unit remediation strategy to use industrial cleanup standards consistent with the 300-FF-1 Final Record of Decision and* specify how sampling will be performed to verify cleanup objectives have been met. This plan will be incorporated into the closure plan, as described in the closure modification requirements contained in 7.8. ... Please revise text to use approved text presented in the January 2004 application as stated above. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, the closure strategy consists of removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Pre-existing soil contamination deeper than 0.5 meters below ground surface and groundwater contamination will be addressed through 300 Area CERCLA response actions. Rewording of Chapter 7.0 was addressed in resolution to comment (9). Comment resolution status: Closed effective 8/31/05.
11.	7.5.4 January 29, 2004 Application language, page 7-16, 7.5.3, line 36. "(based on the MTCA clean closure standards for TSD contaminants of concern or approved alternative)," May 11, 2005 Application language "consistent with the current 300-FF-2 operable unit remediation strategy to use industrial cleanup standards consistent with the 300-FF-1 Final Record of Decision" Please revise text to use approved text presented in the January 2004 application as stated above. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, the closure strategy consists of removal of the TSD unit components and removal of soil to a depth of 0.5 meter under the TSD unit footprint, as addressed in the closure plan. Pre-existing soil contamination deeper than 0.5 meters below ground surface and groundwater contamination will be addressed through 300 Area CERCLA response actions. Rewording of Chapter 7.0 was addressed in resolution to comment (9). Comment resolution status: Closed effective 8/31/05.
12.	The agreed to text modified the January 2004 application to read as follows; "7.7 Schedule for Closure December 2004 version The closure schedule is presented in Appendix 7A of this closure plan. Removal of inventory from B-Cell, D-Cell, and the HLV already has been completed in accordance with the Tri-Party Agreement milestones M-89-01 and M-89-02 and is reflected in the closure schedule provided in Appendix 7A. Because of the complexity and significant radiological contamination of the 324 Building, the schedule proposed for completion of M-89-00 is greater than 180 days." The May 11, 2005 application inserted new language without acknowledging or approval. Delete line 22 through 30 which inserted confusing discussion of TPA milestone M94. Use only agreed to text presented above. Comment resolution: Per discussions with Ecology and RL at July/August 2005 workshop meetings, schedule wording is being revised as appropriate for submittal of Revision 3 of the closure plan to Ecology. Rewording of Chapter 7.0 was addressed in resolution to comment (9). Comment resolution status: Closed effective 8/31/05.
13.	8-i. Editorial comment. A space should be deleted between sections 8.1.5 and 8.1.6. A space should be added after section 8.1.6.

age 290 of 293 of DA01225050

Comment resolution: Spacing between sections and subsections being reviewed by document specialist for document consistency. Corrections will be incorporated as necessary in submittal of Revision 3 of closure plan to Ecology. Based on the July/August 2005 workshops, Chapter 8.0 was reworded to read as follows:

8.0 CLOSURE SURVEILLANCE AND MAINTENANCE ACTIVITIES

Closure of the 324 Building REC is being integrated with the 324 Building deactivation and disposition (including D&D activities). The closure strategy is removal of the TSD unit components and removal of the soil to a depth of 0.5 m under the TSD unit footprint. If it is not possible to achieve the closure performance standards, surveillance and maintenance (S&M) actions will be required until building D&D and the final remediation of the associated OU. Figure 8-1 provides a flow diagram illustrating potential closure S&M scenarios and associated closure actions. Contingency plans have been developed for these actions. This chapter is organized as follows:

- Section 8.1 – Following closure, there are a number of administrative activities that must be taken, even if clean closure can be realized. These actions are described in Section 8.1.
- Section 8.2 – If closure performance standards cannot be met for the TSD unit (i.e., tanks, piping, or structure), then additional closure S&M actions would be required. These contingency plans are presented in Section 8.2.
- Section 8.3 – If soil or groundwater is potentially impacted by TSD operations then contingency plans for the cleanup must be implemented. These actions are described in Section 8.3.

If it is determined to leave waste in place following closure (i.e., close as a landfill), a post-closure plan or approved equivalent will be submitted as an amendment of this closure plan that will meet the requirements of WAC 173-303-610 (7) - (11) (Section 8.1.3). However, if it is necessary to maintain the unit components in a stable state for an extended period of time during the closure process (due to coordination with deactivation activities), the S&M activities will be imposed. These S&M activities are described in Section 8.2.

8.1 GENERAL ADMINISTRATIVE ACTIONS

Following completion of the removal and decontamination closure actions a number of administrative steps will be necessary leading up to the D&D of the building and the final remediation of the associated operable unit components.

8.1.1 Hazards Characterization Information

Hazards characterization information will be maintained in accordance with the guidance provided in Section 8.0 of the TPA (Ecology, et al 1996). S&M activities will continue as appropriate during all phases of 324 Building REC closure and facility disposition activities. The following list is maintained as part of the 324 Building operating records and hazards information:

- Essential diagram drawings required to support S&M and D&D
- Chemical and hazardous substance inventory
- Description and photos of hazardous areas
- Final radiological surveys and maps
- Industrial space hazards identified
- Radioactive and mixed waste accumulation areas identified
- Waste characterization data
- Structural and roof studies
- Fire hazard analysis requirements
- Compliance with Hazards Communication, Asbestos Control, and Confined Space Programs.

8.1.2 Building Care, Use, and Security

Due to the complexity and significant radiological contamination of the 324 Building, closure actions will be closely integrated with the overall deactivation and disposition activities. This integration process is described in Chapter 1.0, Section 1.5. S&M actions will be performed until the building and soil (to a depth of 0.5 m under the TSD unit footprint) are removed. The objectives of the S&M are to ensure adequate containment of any contaminants left in place (both dangerous wastes and radiological), to provide physical safety and security controls and maintain the building in a manner that will present no significant risk to human health or the environment until final disposition is complete. This approach is consistent with the requirements in the Tri-Party Agreement, Section 8.0.

S&M activities include the following:

- **Facility Maintenance** - Preventive maintenance activities for any remaining active systems will be performed. In addition, the adequacy of the existing roof will be evaluated periodically (i.e., five year maximum) and will be repaired as necessary.

- **Facility Surveillance** - Routine (i.e., quarterly) walkdowns will be performed to look at general condition and the status of any remaining active systems (e.g., lighting, emergency power, etc.).

- **Radiological Controls** - As part of the routine surveillances, radiological surveys will be performed.

- **Hazards Protection** - Any remaining hazards (i.e., industrial, chemical, radiological) will be confined and actions taken to ensure hazards are mitigated or managed throughout the duration of the S&M phase. The contingent actions required by this closure plan if dangerous waste constituents are left in place are addressed in Sections 8.2 and 8.3.

- **Safeguards and Security** - The 324 Building will be locked at all times with access limited to S&M staff and emergency response personnel. Signs describing entry requirements will be posted at the entry. These actions will ensure the WAC 173-303-610(7) security requirements are met if dangerous waste residuals are also left in place. General security requirements for the persons entering the 300 Area are provided in Chapter 2.0, Section 2.4. These requirements are established by RL, and are reviewed periodically and updated as needed to ensure an appropriate level of protection.

- **Cost and Schedule** - The S&M plan would include cost estimates and schedules to ensure the objective of the program can be fully met until final facility disposition occurs (meeting WAC 173-303-620 requirements).

In addition to the actions described, additional actions are included in Section 8.3, in the event that closure standards are not attainable.

8.1.3 Amendments

If an amendment to the approved closure plan or the contingent post-closure plan is required at any time prior to the notification of partial or final closure, RL will submit a written request to Ecology as described in Chapter 7.0, Section 7.8. If the need for post-closure care beyond what is described in Section 8.3 is identified, an updated post-closure plan will be prepared in accordance with WAC 173-303-610(8) as an amendment to this closure plan.

8.1.4 Land Authority and Deed Notice

If closure is not achieved in accordance with this closure plan, the requirements for notice to local land authority [WAC 173-303-610(9)] and for notice in deed to property [WAC 173-303-610(10)] will be identified as ARAR for the CERCLA operable unit remedial action process. These notices are to ensure a survey plat, deed notations, (or other legal instrument) and final closure/remediation records are prepared and properly submitted.

8.1.5 Certification of Completion

Within 60 days of completing all the closure activities, RL will submit a certification of closure (or post-closure care if applicable) to Ecology, as described in Chapter 7.0, Section 7.9.

8.1.6 Solid Waste Management Unit Reporting

After the closure activities are completed, Waste Identification Data System (WIDS) descriptions of the Solid Waste Management Units (SWMUs) located in the 324 Building will be updated. In order to maintain a current description of the SWMUs, the WIDS descriptions will be updated within 60 days after a change is made to the respective SWMU. Changes made to the SWMUs will include removal (e.g., flushing, emptying, discharging, leaking, etc.) or placement of waste or material in or on the SWMU. In addition, changes made to the SWMUs will include configuration changes such as the movement, removal, or addition of ancillary equipment, container lids, etc. At a minimum, the WIDS information will be taken into consideration prior to initiating any RCRA corrective action on any 324 Building SWMU.

8.2 CLOSURE SURVEILLANCE AND MAINTENANCE SCENARIOS

Figure 8-1 provides a logic flow diagram used for identifying potential closure surveillance requirements for a number of potential closure scenarios. This process provides contingency plans for dealing with those situations where the closure standards cannot be met.

8.2.1 Tanks and Piping

As described in Chapters 6.0 and 7.0, the objective of the closure plan is to remove all mixed waste unit components, including the applicable dangerous waste tanks and associated ancillary equipment and piping. However, if there are tanks or piping runs that cannot be removed to meet the closure standard, actions will be taken to immobilize the residual dangerous and mixed waste contamination. Following these actions, S&M activities will be performed until removal actions occur. As part of the routine inspections and walk downs, the location of these systems or areas will be noted and specific inspections performed to ensure the integrity and status of the areas are being maintained as planned in accordance with this chapter.

In addition, the building roof surveillance also will include the requirements from WAC 173-303-610 and -640(8), to ensure the building itself is being maintained as the containment structure. These requirements include preventing any precipitation from entering the building, as well as ensuring run-on/run-off is directed away from the building and the areas with residual dangerous waste. The roof will undergo periodic maintenance to ensure it meets the containment structure requirements. No preventive maintenance is planned for any of the remaining tanks, piping, or structures during the S&M phase. However, if conditions are identified during the inspections that change the status of these items from the manner they are documented by facility operating records and hazards information (i.e., piping breaks, spread of contamination, etc.), these conditions will be promptly corrected, consistent with the original closure actions.

8.2.2 Building Areas

The objective of the closure plan is to remove all mixed waste unit components, including the REC cells, HLV/LLV tanks and ancillary piping that handled dangerous waste, and the HLV/LLV vaults. This process is described in Chapters 6.0 and 7.0. However, if these standards cannot be attained, actions will be taken, if necessary, to immobilize the residual dangerous waste contamination. Following these actions, S&M activities will be performed prior to removal of these components. These activities are the same as those needed for tanks and piping, as described in Section 8.2.1.

8.2.3 Soil

The closure strategy for soil potentially contaminated with dangerous waste constituents from TSD operations is provided in Chapter 6.0. This closure strategy is based on removing the TSD unit components and removing soil to a depth of 0.5 m under the TSD unit footprint. As indicated in Chapter 6.0, Table 6-1, the performance standard for closure of each component is removal.

8.2.4 Groundwater

A discussion of groundwater is provided in Chapter 5.0. Groundwater contamination existed prior to the operations of the 324 Building. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

8.3 CONTINGENT PLAN FOR SOIL/GROUNDWATER

During the S&M phase, containment of the areas will be met by maintaining the surrounding building roof and structure. In addition, if it is determined to leave waste in place at closure (i.e., close as a landfill), a post-closure plan or approved alternative will be submitted and will meet the requirements of WAC 173-303-610(7) - (11).

Soil and groundwater contamination existed prior to the operations of the 324 Building. Closure activities for the 324 Building TSD unit will include removal of soil to a depth of 0.5 m under the TSD unit footprint. The pre-existing soil and groundwater remediation will be addressed through 300 Area CERCLA soil remediation activities.

age 299 of 299 of DA0824450

	Comment resolution status: Closed effective 8/31/05.

Change Number	Federal Facility Agreement and Consent Order	Date:
M-89-04-01	**Change Control Form** Do not use blue ink. Type or print using black ink.	October 18, 2005

Originator: K. A. Klein, RL/Dale Jackson, RL	**Phone:** 509-376-7395/509-376-8086

Class of Change:

[X] I - Signatories	[ ] II - Executive Manager	[ ] III - Project Manager

Change Title:

Extend completion Due Date for Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Major Milestone M-89-00 to Align with Tri-Party Agreement Interim Milestone M-094-03 Due Date

Description/Justification of Change:

In October 2001, the U.S. Department of Energy, Richland Operations Office (RL), the State of Washington, Department of Ecology (Ecology), and the U.S. Environmental Protection Agency (EPA), hereinafter referred to as the Parties, agreed to cleanup schedules consistent with the common objective to achieve remediation of waste sites and facilities located along the Columbia River by September 30, 2015.(See Tri-Party Agreement Change Number M-94-04-01) The workscope identified in Tri-Party Agreement Interim Milestone, M-094-03, *Complete Disposition of the following Surplus Facilities: 303M, 322, 333, 334, 334A, 3221, 3222, 3223, 3224, 3225, 324, 324B, 327 (See Tri-Party Agreement Change Number M-094-01-01, Table 1)* includes the complete disposition of the 324 Building by September 30, 2010.

The scope of Tri-Party Agreement Major Milestone M-89-00 is to complete closure of non-permitted mixed waste units in the 324 Building as described in the *324 Building Radiochemical Engineering Cells, High Level Vault, Low-Level Vault, and Associated Areas Closure Plan, DOE/RL-96-73* (324 Building Closure Plan).

In July 2002, an amendment to the 324 Building Closure Plan was prepared and submitted to Ecology. The amendment was approved by Ecology in December 2002. The purpose of the amendment was to change the existing path forward as described in the 324 Building Closure Plan from one of clean closure of the units to a path where the high risk materials and wastes are removed from the facility followed by complete disposition of the 324 Building. The amendment was incorporated into the body of the 324 Building Closure Plan and submitted to Ecology in January 2004. Revisions were incorporated into the Closure Plan and the plan will be approved by March 2006.

The Tri-Party Agreement Major Milestone M-89-00 workscope is a parallel activity with Tri-Party Agreement Interim Milestone M-094-03 workscope. Certification of closure will not be approved by Ecology until after complete disposition of the 324 Building by September 30, 2010. Therefore, the purpose of this milestone is to change the due date for the M-89-00 milestone from October 31, 2005 to September 30, 2010 to align with the M-094-03 due date. M-094-03 is not impacted by this change package.

Modifications/deletions of existing milestones are denoted using ~~strikeout~~; additions are denoted with shading

Milestone Number	Title	Due
M-89-00	*Complete Closure of Non-Permitted MW Units in the 324 Building REC B-Cell, REC D-Cell, and High Level Vault*	~~10/31/2005~~ 09/30/2010

Impact of Change:

This change has no impact on the health and safety of workers or the environment. This change does not impact the scope of work defined by M-89-00.

Affected Documents:

The Tri-Party Agreement as amended and Hanford Site internal planning, management, budget documents (e.g., USDOE and USDOE contractor Baseline Change Control documents; Multi-Year Work Plan; Sitewide Systems Engineering Control Documents; Project Management Plans, and, if appropriate, LDR Report requirements) and the *324 Building Radiochemical Engineering Cells, High Level Vault, Low-Level Vault, and Associated Areas Closure Plan*, DOE/RL-96-73.

Approvals:

for K. A. Klein, RL Manager	10/26/05 Date	✓ Approved	___ Disapproved
L. M. Bogert, Regional Administrator EPA	Date	___ Approved	___ Disapproved
J. Manning, Ecology Director	Date	___ Approved	___ Disapproved